RECURRENT INTRAOCULAR HEMORRHAGE IN YOUNG ADULTS (EALES'S DISEASE)

A REPORT OF THIRTY-ONE CASES

BY *A. J. Elliot,* M.D.*

ALTHOUGH this condition is generally thought to be rare, 31 cases have been observed during the past ten years. It was first described by Henry Eales (1) in 1880; he reported five cases of young men between fourteen and twenty-nine years of age with recurrent hemorrhages in the retina adjacent to the veins and in the vitreous. He considered that chronic constipation was the starting point for the condition. Since that time the disease has been known in the English-speaking world as Eales's disease. However, Duke-Elder (2) states that "it is not a disease entity but a clinical manifestation of many diseased conditions."

The disease usually occurs in an apparently healthy young adult male, with a sudden, painless blurring of vision on awakening in the morning. The hemorrhages typically occur in the periphery of the fundus and are usually associated with the retinal veins, which show marked perivascular exudation, varying from a narrow parallel sheathing to extensive exudation. As a rule the veins tend to be dilated but in some places they may be beaded or occluded over short segments of their course. In the beginning the hemorrhages are usually confined to the retina, but it is only a matter of time until one occurs which is of sufficient magnitude to burst through the internal limiting membrane of the retina into the vitreous. Recurrences are the rule and the vitreous usually never completely clears before another hemorrhage takes place; thus the visual acuity at any given time is a poor measure of the ocular disability. The hemorrhages tend to become less frequent as time goes on and may cease altogether. When this occurs the vitreous

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opacities may be absorbed and normal vision may be recovered. The common complications are permanent vitreous opacities, vascularization of the vitreous, retinitis proliferans, chronic uveitis, and secondary glaucoma.

There have been relatively few reports of this condition in the English literature since J. Hutchinson (3) in 1881 confirmed Eales's findings. H. Hutchinson (4; 1932), Paton (5; 1938), Juler (6; 1942), O'Malley (7; 1943), and Cross and Choyce (8; 1953) are the important contributors to the ophthalmic literature in English. In each of these reports only a relatively few cases were observed. However, larger series have been reported in the ophthalmic literature in German; notable among them are those of Wendling (9; 1939), Meyer (10; 1940), Werdenberg (11; 1940), and Schmid (12; 1945). Other foreign reports have appeared with less clinical material; among them are those of Kokott (13; 1935), Palomar (14; 1943), Silverskiold (15; 1947), and di Luca (16; 1948). Study of the German reports indicates that the cases are considered to be retinal periphlebitis of tuberculous etiology. A prominent feature was anterior uveitis, which was complicated by posterior uveitis and vitreous hemorrhages. This clinical picture differs from that presented by the cases reported in the English literature and in the series in this study; in these anterior uveitis is notably absent.

A review of the 31 cases in this study shows that the clinical history and findings are so similar in almost all of them that it would seem that the disease is a definite clinical entity and not a manifestation of many diseased conditions (17). In two of the cases (Cases 10 and 14) no hemorrhages were noted in the vitreous at any time, nor were there hemorrhages in the retina, although the peripheral retinal veins were dilated and tortuous and exudation was present in the periphery of the retina (See Figures 16 and 19). It could be that this ophthalmoscopic picture is the precursor of the recurrent intraocular hemorrhages and represents a definite state of the disease entity. In most of the cases reported here the disease progressed to the active period of recurrent intraocular hemorrhages and, after a period of activity averaging 2.9 years, became inactive with no further hemorrhages.

It was noted in nearly all the cases studied in this group that

the hemorrhages usually occurred after periods of sleep or relative quietness—walking, riding, and so on, and not after strenuous exercise.

In the two females in the series no correlation was noted between the menstrual cycle and the occurrence of the hemorrhages into the retina and vitreous.

The diagnosis of Eales's disease should be differentiated from thrombosis of the central retinal vein in the young adult, chronic uveitis with vitreous opacities, Coats's disease, and diabetic retinitis proliferans. Thrombosis of the central retinal vein involves the posterior part of the eyeball at the onset, while the periphery of the retina is essentially normal; in Eales's disease the hemorrhages are characteristically in the periphery at the onset and the posterior segment of the eyeball is relatively normal. Two of the cases in this series were diagnosed as thrombosis of the central retinal vein at the beginning of the disease. There was no evidence of chronic uveitis in the anterior portion of the eyeball, and the results of slit-lamp examination were normal except for the red blood cells in the vitreous.

ETIOLOGY

The etiology of recurrent intraocular hemorrhages is controversial and at various times many causes have been advanced. Duke-Elder (2) considers the three commonest etiologic factors to be tuberculosis, septic foci, and thromboangiitis obliterans.

TUBERCULOSIS

Since the tuberculous etiology was first proposed by Axenfeld and Stock (18; 1911), evidence has been accumulating which suggests that tuberculosis is a common cause of these recurrent hemorrhages. Several European writers have reported the tuberculous etiology of retinal periphlebitis. Fleischer (19), in the study of an enucleated eye, noted that the pathologic lesion around the veins resembled tuberculosis. Finnoff (20; 1921) reported 5 cases of recurrent intraocular hemorrhage and tabulated 110 cases in the literature, of which 27 had evidence of tuberculous infection; 9 of these had active tuberculosis. Gilbert (21;1935) reported tubercle bacilli in the round cell perivascular infiltration in the pe-

ripheral veins. In 1940 Meyer (10) concluded from the pathologic study of 33 eyes that the retinal lesions were tuberculous. In 1945 Schmid (12) in an exhaustive review of the literature and in a study of 25 of his own patients was of the opinion that most of these patients had tuberculous disease. Verhoeff and Simpson (22) reported retinal periphlebitis in one eye and subsequent occlusion of the central retinal vein in the other eye. Microscopic sections of the latter eye revealed epithelioid cells in the wall of the vein which were characteristic of tubercles. They felt there was no doubt of the tuberculous origin of the retinal periphlebitis in the first eye.

A difficult question to answer is how the tubercle bacilli reach the perivascular spaces and the adventitial coats of the affected vein. Uyama (23) and Finnoff (24) attempted to produce the retinal lesion experimentally in rabbits, but it was difficult to reproduce the condition by injecting tubercle bacilli and the data are inconclusive.

THROMBOANGIITIS OBLITERANS

In 1935 Marchesani (25) described microscopic sections indicating narrowing and obliteration of the vascular lumen in retinal periphlebitis in three patients with Buerger's disease. Since then Schmid (12) studied 85 patients with Buerger's disease; of these 65 were subjected to arteriography examinations and in no case was retinal periphlebitis found.

SEPTIC FOCI

Foci of infection are described as being responsible for recurrent intraocular hemorrhages but there is little evidence to uphold this view.

SENSITIVITY TO TUBERCULOPROTEIN

After studying these 31 patients closely for periods up to ten years, two factors became apparent:

1. The skin tuberculin test was positive in all cases except one doubtful case;
2. Active or healed pulmonary tuberculosis was present in 35 percent of the cases.

The positive skin tuberculin test in the patients is noteworthy in view of the surveys of tuberculin skin tests in the younger adult population of the comparable age group which indicate that only 25 to 40 percent of the tests given to such individuals are positive. It would seem that the patients with recurrent hemorrhages into the retina and vitreous have become sensitized to the tuberculoprotein and a local state of hypersensitivity may have developed in the walls of the retinal veins, with resultant exudation and hemorrhages. The observation of Werdenberg (26) is of interest; he noted frequent focal reactions in the eye, with exudation and hemorrhage into the vitreous, after injections of tuberculin. Such focal reactions occurred on several occasions in Case 11 of this study. Of further interest is the comparable situation from the etiologic point of view which may exist in conjunctival phlyctenules and erythema nodosum (Doxiadis, 27). In these latter conditions, it is probable that a state of hypersensitivity to tuberculoprotein may exist in most instances. From the observations in the present study a fourth theory is proposed as an etiologic factor in addition to those noted by Duke-Elder (2). It may be that the condition occurs in individuals who have been previously sensitized to the tuberculoprotein and the exudation and hemorrhages into the retina and vitreous are a reaction of a hypersensitive vessel wall.

Trauma may act as an exciting factor once the disease has developed. This was noted in Cases 20, 28, and 29 (see case reports). There was no evidence that a dietary deficiency existed in any of the patients in this series except in Case 9; this patient had suffered from beriberi as a prisoner of war.

PATHOLOGY

Study of the pathologic changes in this disease has been undertaken by comparatively few individuals. Fleischer (19; 1914) was the first to report the pathologic changes in an eye with tuberculous periphlebitis. Since then Axenfeld (28), Suganuma (29), Gilbert (21), von Hippel (30), Ballantyne and Michaelson (31), Meyer (10), and Guyton and Reese (32) have described the pathologic changes in eyes removed for secondary glaucoma following recurrent intraocular hemorrhages. Fleischer (19) described epi-

thelioid cells with some giant cells surrounding the retinal veins in the form of tubercles which more or less occluded the vessel. A nodular iritis was present in his patient. Gilbert (21) reported tubercle bacilli in the periphlebitic infiltration. Meyer (10) described the pathology in 33 eyes removed for tuberculosis. He noted the perivascular infiltration, composed of lymphocytes, permeating the vessel wall, and an accompanying proliferation of cells in the vessel walls which frequently led to narrowing and obliteration of the lumen. However, Ballantyne and Michaelson (31), in their study of an eye removed for secondary glaucoma following recurrent vitreous hemorrhages, showed that many of the retinal veins had varying degrees of cellular infiltration. The perivascular infiltration was composed chiefly of lymphocytes, and at no time did the cells suggest a tuberculous or syphilitic process. Guyton and Reese (32) described an inflammatory occlusion of the retinal veins and arteries and a peculiar thickening of the internal limiting membrane, but stated that the inflammatory response was nonspecific in type.

Survey of the literature of the pathologic changes revealed that all studies, except Marchesani's (25), had been made on eyes which were removed because of secondary glaucoma. In Marchesani's Case 3 the patient had peripheral endarteritis obliterans with dry gangrene of the fingers and toes. She died from uremia six months after the retinal hemorrhages occurred in her right eye. Study of the microscopic sections of the eye showed thickening of the intima in the retinal vessels, but no perivascular cuffing was noted.

In the present study three eyes were available for pathologic study. Two of the eyes were removed because of pain from secondary glaucoma after repeated intraocular hemorrhages (Cases 11 and 12). The third and most interesting eye was removed from a patient who died from tuberculous pericarditis within six months of the onset of the recurrent intraocular hemorrhages (Case 4). From this material it was possible to classify the pathologic changes into early and late stages.

EARLY STAGE

Study of microscopic sections from the entire eye revealed that some of the retinal vessels were surrounded by a few lymphocytes,

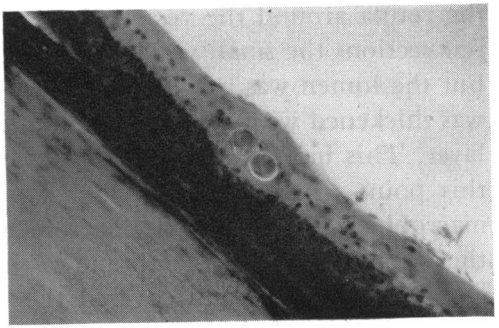

FIGURE 1. CASE 4
Hyaline thickening of wall of peripheral retinal vessel.

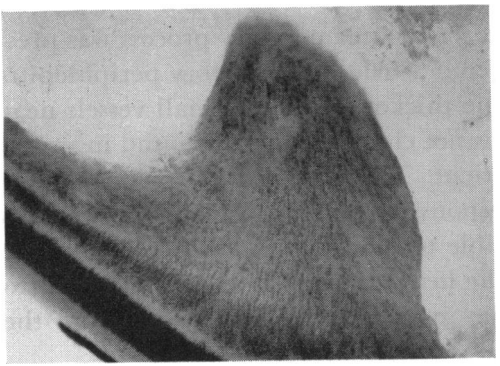

FIGURE 2. CASE 4
Glial tissue in macular area.

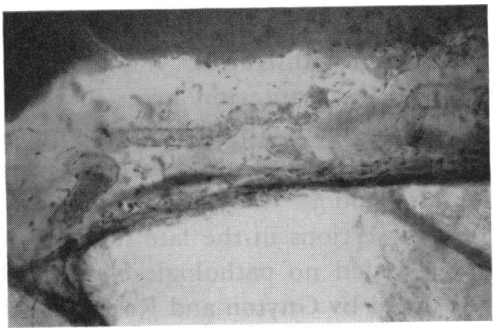

FIGURE 3. CASE 4
New thin-walled vessels in vitreous hemorrhage.

but on the whole there was little if any inflammatory reaction in the retina around the vessels. At the periphery of the retina in a few sections the small vessels had a hyaline thickening of the wall but the lumen was patent (Fig. 1). In the macular area the retina was thickened with a proliferation of glial tissue in the nerve fiber layer. This mound extended into the vitreous, and the retina at this point was infiltrated with large numbers of pigment-filled macrophages (Fig. 2). The macrophages were also present along the internal limiting membrane of the retina and about many of the retinal vessels, and covered the optic nervehead. In the anterior portion of the vitreous there was a funnel-shaped mass of fresh hemorrhage with the apex posteriorly; in the region of the apex very thin-walled vessels were seen (Fig. 3). However, no connection with the retinal vascular system could be traced from these thin-walled vessels.

Thus it was clear that no actual inflammatory process was present around the vessel walls and a true inflammatory periphlebitis was not present. The hyaline thickening of the small vessels near the periphery of the retina is not characteristically found in young individuals such as this patient. The proliferation of glial tissue at the macula may be a response to irritation from the vitreous hemorrhage. It is only possible to speculate as to the origin of the thin-walled vessels within the hemorrhage; they did not appear to be a rete mirabile, but they may possibly have come from the hyaloid system.

LATE STAGE

Study of the sections from the two eyes removed for secondary glaucoma revealed similar findings in both cases. Peripheral anterior synechias were present and the iris and ciliary body were infiltrated with lymphocytes and plasma cells. The cells were most dense in the anterior layers of the iris root. The retinal vessels were surrounded by a cuff of lymphocytes in many areas and some of the vessels were obliterated by proliferation of the endothelium (Figs. 4 and 5).

The sections in the late stage of the disease from Cases 11 and 12 revealed no pathologic changes characteristic of tuberculosis. As noted by Guyton and Reese (32) the changes are nonspecific in

type in that perivascular infiltration, epithelioid cells, and endarteritis obliterans are found in many other conditions of the retina, especially when there has been previous hemorrhage with resultant cholesterol deposits.

The pathologic findings in the early stage in the retinal vessels

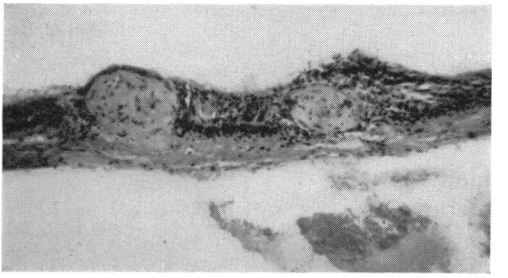

FIGURE 4. CASE 11
Obliteration of lumen of retinal vessels, with some perivascular infiltration of lymphocytes.

are compatible with the theory that the disease has an allergic basis.

ANALYSIS OF THE DATA

GEOGRAPHICAL LOCATION OF CASES AT ONSET OF DISEASE

In view of the numerous reports of large series of retinal periphlebitis in the European literature and the almost complete absence of such series in the American literature, it might have been

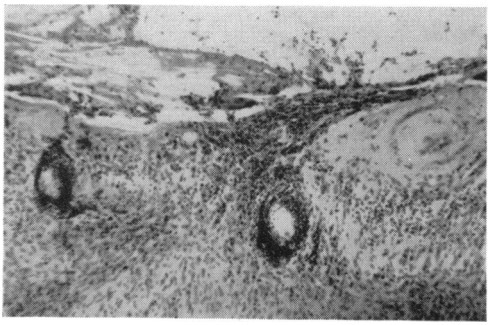

FIGURE 5. CASE 12
Perivascular infiltration and obliteration of lumen of retinal vessels.

thought that the disease was a European one. Table 1 shows the geographical distribution of the 31 patients in this group at the onset of the illness.

TABLE 1. GEOGRAPHICAL LOCATION OF CASES AT ONSET OF DISEASE

	No. of Cases
Canada	
Civilians	11
Veterans	9
England	
Veterans	11
Total	31

This distribution indicates that geographical location has no significance. All the patients developing the disease in England were veterans and were repatriated to Canada, where the clinical follow-up was carried out.

DURATION OF OBSERVATION

Table 2 indicates the duration of observation of the 31 cases of Eales's disease in this study.

TABLE 2. DURATION OF OBSERVATION OF 31 CASES OF EALES'S DISEASE

Period	*No. of Cases*
0–6 months	2
½–3 years	9
3–6 years	5
6–10 years	12
10–17 years	3

Average period of observation: 5.9 years

AGE INCIDENCE

Table 3 indicates the age incidence in 31 cases of recurrent intraocular hemorrhages in which 46 eyes were affected.

TABLE 3. AGE INCIDENCE IN 31 CASES OF EALES'S DISEASE WITH A TOTAL OF 46 AFFECTED EYES

Age at Onset	*Number*
17–25 years	21
26–44 years	25

Average age: 26.9 years

EYE AFFECTED

Table 4 indicates that the right and left eyes were affected equally in this study and that in 15 cases both eyes were involved.

TABLE 4. EYE AFFECTED IN 31 CASES OF EALES'S DISEASE

	Group 1	*Group 2*	*Total*	*Percent*
Right	3	5	8	26
Left	1	7	8	29
Right and left	4	11	15	45
Total	8	23	31	100

Thus it is probable that the second eye will become involved in approximately half of the cases, and the disease may manifest itself in the beginning with equal likelihood in either eye.

INCIDENCE OF TUBERCULOSIS

In this group of patients with recurrent intraocular hemorrhages 8 of the 31 cases had active or healed pulmonary tuberculosis, as shown in Table 5.

TABLE 5. TUBERCULOSIS IN 31 CASES OF EALES'S DISEASE

	Number	*Percent*
Group 1. Active or healed	8	35
Group 2. No signs of tuberculosis	23	65

In the 23 cases in which no signs of tuberculosis could be found, the skin tuberculin test was positive except in one doubtful case. Of the 35 percent of the patients in this study who had (or had had) tuberculosis, one patient (see report of Case 4) died from

tuberculous pericarditis six months after the onset of the retinal and vitreous hemorrhages.

INTERVAL UNTIL SECOND EYE AFFECTED

Table 6 shows the eye which was affected first by the retinal and vitreous hemorrhages and the interval before the second eye was involved.

TABLE 6. INTERVAL UNTIL SECOND EYE AFFECTED

	Eye Affected First (*Cases*)	*Interval before Second Eye Affected* (*Years*)
Right eye	4	2.4
Left eye	7	1.5
Right and left eye simultaneously	4	0.0
Total	15	—
Average	—	1.3

From this table it would appear that if the second eye is to be eventually affected it will become diseased relatively soon after the first eye, probably within one and a half years and probably not after more than three years have elapsed.

ULTIMATE VISION IN 31 CASES OF EALES'S DISEASE WITH 46 AFFECTED EYES

Table 7 is an analysis of the ultimate visual acuity in the series. Group 1 includes 8 patients who had active or healed pulmonary tuberculosis during the ocular illness and Group 2 includes 23 patients in whom no signs of pulmonary tuberculosis were found.

TABLE 7. ULTIMATE VISION IN 31 CASES OF EALES'S DISEASE WITH 46 AFFECTED EYES

	Group 1 (*12 Affected Eyes*)	*Group 2* (*34 Affected Eyes*)	*Percent*
Good (20/20–20/50)	4	21	54
Fair (20/60–20/200)	5	4	20
Poor (less than 20/200)	3	9	26

The average period of observation in the group which ultimately had good visual acuity was 4¾ years. Approximately one quarter of the patients ultimately had poor vision; these cases were observed for an average of 6 years.

ULTIMATE VISION IN FIRST AND SECOND EYE AFFECTED IN 15 CASES OF BILATERAL EALES'S DISEASE

Table 8 indicates the present visual acuity in the 15 patients in whom both eyes were affected by the recurrent intraocular hemorrhages.

TABLE 8. ULTIMATE VISION IN FIRST AND SECOND EYE AFFECTED IN 15 CASES OF BILATERAL EALES'S DISEASE

	First Eye	*Second Eye*	*Percent*
Good (20/20–20/50)	4	13	57
Fair (20/60–20/200)	4	0	13
Poor (less than 20/200)	7	2	30

This table shows that where both eyes become affected with Eales's disease, the ultimate visual acuity in the first eye involved may be poor in half of the cases, while the vision in the second diseased eye almost invariably remains good.

CORRELATION OF VISUAL ACUITY AND PERIOD OF ACTIVITY IN 46 EYES WITH EALES'S DISEASE

Table 9 is a correlation of the visual acuity with the duration of the recurrent hemorrhages.

TABLE 9. CORRELATION OF VISUAL ACUITY AND PERIOD OF ACTIVITY IN 46 EYES WITH EALES'S DISEASE

VISION	PERIOD OF ACTIVITY				
	1 Year or Less	*2 Years*	*3 Years*	*5 Years*	*10 Years or More*
Good (20/20–20/50)	8	8	4	2	3
Fair (20/60–20/200)	3	2	1	1	1
Poor (less than 20/200)	5	3	1	3	1
Total	16	13	6	6	5

Average period of activity, 2.9 years

In nearly one third of the affected eyes the visual acuity remained good when the period of activity was two years or less. The data indicate that the probability of retaining good vision is better if the duration of recurrent hemorrhages is less than two years.

CASE HISTORIES

The 31 case histories which follow have been included in order to provide evidence that this disease is a clinical entity and not a manifestation of many diseased conditions.

Cases 1 and 4 are representative of Group 1, in which active or healed pulmonary tuberculosis was present in all cases.

Cases 11, 21, and 26 are representative reports of Group 2, in which no signs of tuberculosis were found, although the skin tuberculin test was positive in all cases except Case 28.

The 31 cases are summarized in tabular form in Table 10.

CASE 1. This patient, aged twenty-nine, first complained of blurring of vision in his left eye while serving as a navigator in the Air Force in Europe early in March, 1945. The vision cleared in about ten days but about the middle of May the vision suddenly became very blurred again. On examination, vision was 20/15 in the right eye and 20/30 in the left. Ophthalmoscopic examination of the left eye revealed numerous hemorrhages in the periphery of the fundus adjacent to the veins. There was marked perivascular exudation along the veins in the periphery of the retina and there was a large absorbing hemorrhage in the vitreous inferiorly. He was admitted to hospital for investigation. The capillary resistance test, bleeding time, clotting time, complete blood studies with differential, sedimentation rate and Wasserman test were all negative. X-ray examination of the chest revealed a small area of fibrosis in the right first interspace which had the appearance of an old healed tuberculous lesion. Repeated sputa and gastric lavages were negative for tubercle bacilli. While patient was in the hospital two further hemorrhages occurred in the left eye. A diagnosis of Eales's disease was made and he was repatriated. In October, 1945, the vision of the left eye had deteriorated to the perception of hand motion at a distance of one foot, and the vitreous was so cloudy because of hemorrhage that the fundus could not be visualized. The vision remained exceedingly poor through the following six months and in the summer of 1946 he noted the vision was returning in the left eye and he was seeing double periodically. At this examination the vision in the right eye was 20/15 and in the left, 20/20. The retinal veins were dilated in an irregular manner in the periphery but no new hemorrhages were

noted. There were a large number of absorbing vitreous hemorrhages inferiorly and around the periphery of the retina. There was a long horizontal scar extending temporally one disc diameter above the disc towards the periphery of the retina. There was no significant change in the left eye until a further large hemorrhage occurred in July, 1947, while he was on vacation; the vision then dropped to less than 20/200. The hemorrhages appeared to be coming from the upper temporal retinal vein in the periphery. Further examination in May, 1948, indicated that the vision in the left eye was approximately 20/400 and, although the disc markings were normal, the nasal border was obscured by a large vitreous opacity and commencing retinitis proliferans was noted in the nasal periphery of the retina. A few small opacities were observed in the posterior subcapsular region of the left lens.

He returned for further examination in September, 1948, stating that he had had a fresh hemorrhage three months previously while on vacation. The vision in the left eye did not improve beyond 20/200. He was seen once or twice a year thereafter. There were no further hemorrhages and he has carried on satisfactorily at his clerical work. At the last examination in December, 1953, the vision in the right eye was 20/15 and in the left it was 20/200. There was still no significant abnormality in the retina of the right eye, but in the left eye the disc markings were blurred by vitreous opacities nasally. In the upper temporal quadrant there was an extensive scar extending one disc diameter above the disc temporally to the periphery of the retina and at one point lying on both sides of the retinal vein. The upper temporal retinal vein was dilated and there was a large loop in the vein in the mid-periphery (Fig. 6). There were many conglomerations of choroidal pigment in clumps and in a dust-like distribution. The lower temporal veins were normal, but retinitis proliferans was present in the lower nasal quadrant with some conglomeration of choroidal pigment. There were many vitreous opacities, but no sign of recent hemorrhage. Further studies of the chest, a complete blood examination, and a skin tuberculin test did not reveal any findings different from those previously noted at other examinations.

This young man has been under frequent observation for nearly nine years. The apparent activity of the disease extended from March, 1945, until July, 1948. Since then there has been no sign of activity in the left eye and the condition is now quiescent. He has also been examined by the chest service annually and although he was considered a case of minimal inactive pulmonary tuberculosis, he has been allowed full activity.

CASE 2. This twenty-year-old male first came under observation in the eye clinic in May, 1942, at which time he was under treatment for active pulmonary tuberculosis in the right lung. He said that in May, 1941,

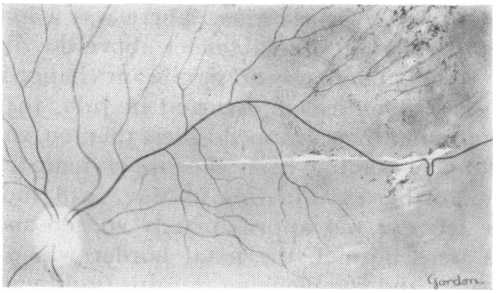

FIGURE 6. CASE 1
Inactive, healed stage, with loop in vein, eight and a half years after onset.

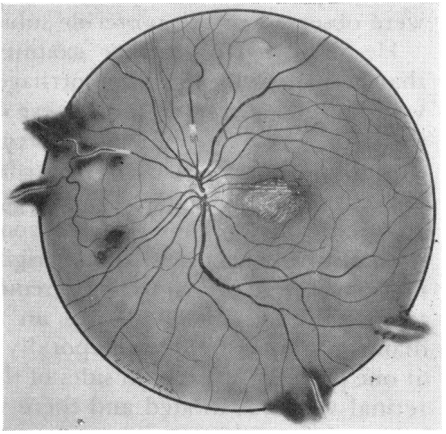

FIGURE 7. CASE 2, RIGHT EYE
Active stage, with peripheral hemorrhages from veins and exudation at onset.

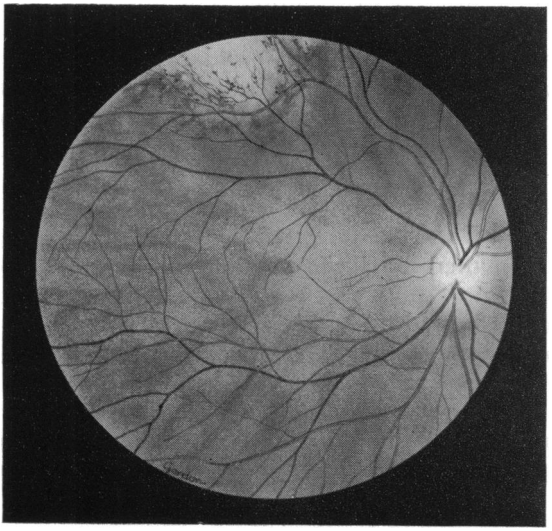

FIGURE 8. CASE 2, RIGHT EYE
Inactive, healed stage, peripheral scarring, ten years after onset.

he had had blurring of vision in the left eye for a period of three weeks. In May, 1942, he again had blurring of vision in his left eye although vision was 20/30 at that time. Ophthalmoscopic examination revealed engorgement of the lower temporal vein with numerous hemorrhages in the adjacent retina peripherally and many hemorrhages nasally (Fig. 7). In July, 1942, the vision of the left eye was reduced to perception of hand motion two days after a large vitreous hemorrhage. He was confined to the tuberculosis sanatorium until December, 1943, and had a continuous right pneumothorax until 1947. He returned to the eye clinic in December, 1943, complaining of sudden blurring in the right eye while in the sanatorium; however the vision was 20/30 in the right eye. In May, 1948, he returned complaining of further periodic attacks of blurred vision in both eyes. At this time vision in both eyes was 20/30.

In January, 1949, he had further blurriness in the left eye although the vision was 20/20 in the right eye and 20/30 in the left eye. Ophthalmoscopic examination revealed in the right eye a large vitreous hemorrhage in the lower nasal retina extending almost to the periphery. There were great masses of large stringy greyish white floaters in the vitreous inferiorly. The left fundus was also slightly hazy and in the lower vitreous there were large greyish white masses which partially covered the fundus in the periphery in the lower nasal quadrant. In the far periphery there was an abnormal vein with perivascular exudation and a small hemorrhage near it, and retinitis proliferans was beginning. In the lower temporal retina peripherally was another abnormal vein with periphlebitis and a small hemorrhage in the adjacent retina.

In July, 1949, the patient returned, stating that further blurring of vision in his left eye had begun while sitting down. The vision was 20/20 in the right eye, but in the left eye he could only perceive hand motion. Ophthalmoscopic examination was difficult in the left eye owing to the large recent vitreous hemorrhage, and no details were observed. He returned periodically for further examination and in December, 1953, he said that he had had numerous small hemorrhages in the right eye about every second month during that year. At this examination the vision was correctable in the right eye to 20/20 and in the left to 20/60. Ophthalmoscopic examination indicated sheathing of the peripheral veins in the right upper temporal retina, and a whitish exudate was present on both sides of the vessel walls. There was some conglomeration of choroidal pigment at several points. In the lower temporal retina there was a small varicosity in the peripheral venule and there was sheathing along several of the small venules (Fig. 8). There were numerous vitreous opacities inferiorly and there was a beginning posterior subcapsular lens opacity centrally. There were several newly formed venules in the upper temporal quadrant. In

the left eye the fundus was obscured because of posterior lens opacities, but the disc and posterior retina appeared to be normal. In the nasal retina near the periphery, there was an extensive L-shaped scar just beyond a bifurcation, beyond which there was sheathing along the lower branch (Fig. 9).

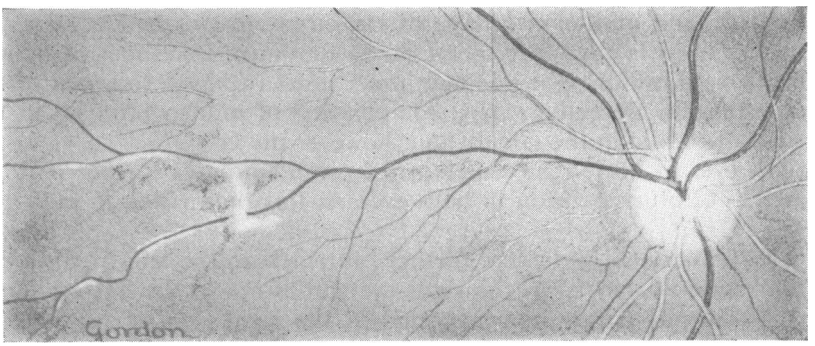

FIGURE 9. CASE 2, LEFT EYE
Peripheral perivenous sheathing, twelve and a half years after onset.

The patient is now thirty-two years of age and has been under observation for eleven years. Although the pulmonary tuberculosis is considered to be arrested, there seems to be continuous activity present as far as the retinal periphlebitis is concerned in the right eye.

CASE 3. This twenty-two-year-old veteran developed pulmonary tuberculosis in his right lung in 1945 while overseas. He was repatriated and admitted to a tuberculosis sanatorium. He had no complaints regarding his eyes until June, 1947, when a severe hemorrhage occurred in the right eye. On examination in July, 1947, the vision in the right eye was reduced to 10/400; in the left eye the vision was 20/20. Ophthalmoscopic examination indicated a large hemorrhage in the vitreous of the right eye, but the fundus could not be observed. In the left eye there were many small hemorrhages in the upper temporal retina peripherally near the veins. He was confined to bed in hospital and in August he suddenly had a large vitreous hemorrhage in the left eye, reducing the vision to 20/400. There was no significant change in the right eye but the retina could not be observed in the left eye. He was placed on 2 Gm. of streptomycin daily until November. The vision in the left eye gradually improved so that by September, 1947, it was 20/100, but there was no improvement in the vision of the right eye. In November, 1947, the vision of the right eye was limited to light perception. The right vitreous was filled with opacities and it was impossible to visualize the fundus. In the left eye the vision was reduced to counting fingers at a distance of six inches. The vitreous was hazy, but not

as dense as that of the right eye; the retina could be observed. The patient was discharged from hospital to the tuberculosis sanatorium, where he remained until April, 1948. Another large hemorrhage occurred in the left eye early in 1948, after which the vision was so poor that he was admitted to the Institute for the Blind for training. He was seen again in February, 1948, at which time the vision was 20/400 in the right eye and counting fingers in the left eye. The right vitreous was still hazy and retinitis proliferans could be seen temporally extending from the disc to the periphery. The left retina could not be observed owing to the large vitreous hemorrhages.

He returned in April, 1948, stating that the vision in the left eye had improved so that he was able to read newspaper print without difficulty. The vision in the right eye was found to be 10/400, while in the left eye it was 20/30. The right vitreous was still hazy, with strands of fibrous tissue extending from the disc towards the periphery of the retina temporally and inferiorly. In the left eye there was a large area of retinitis proliferans floating in the vitreous. In June, 1948, the vision had improved in his right eye to 20/200, but the vision had deteriorated in the left so that he could only count fingers. Ophthalmoscopic examination revealed that the disc was obscured temporally by a mass of retinitis proliferans involving the lower temporal retina. There was a large vitreous strand running up from the disc into the vitreous anteriorly to the posterior surface of the lens; temporally to this strand there were dilated blood vessels. There was beginning retinitis proliferans in the upper nasal quadrant. In the left eye the reflex was almost black.

An acute secondary glaucoma developed in the right eye in April, 1949, and the eye became painful and red for a month. The intraocular pressure was 60 mm. Hg (Schiötz) in the right eye and 16 mm. Hg (Schiötz) in the left eye. There was a flare and many cells were present in the anterior chamber of the right eye. On local treatment the eye became asymptomatic in four weeks. In December, 1953, there was no light perception in the right eye but the patient was able to perceive light in the left eye. The right iris stroma had become markedly depigmented. There were many fine capillaries on the anterior surface of the right iris and ectropion uveae was present. The left iris was not depigmented but there were some small capillaries on the anterior surface. The right eye was turning outward approximately 30 degrees. The intraocular pressure was 21 mm. Hg (Schiötz) in each eye. The right lens had become cataractous. No red reflex was obtained ophthalmoscopically in either eye.

This patient developed massive vitreous hemorrhages in both eyes while undergoing treatment for pulmonary tuberculosis in July, 1947, and recurrent hemorrhages occurred frequently during the following year and his vision was lost rapidly. He was under observation in the

chest clinic periodically and it was felt that the tuberculosis had become inactive in 1949. The patient became well adjusted to the blindness and has been carrying on as a writer.

CASE 4. This twenty-four-year-old wireless operator was admitted to hospital on March 29, 1946, complaining of blurring of vision in the right eye. He stated that he had always been in good health until six days previously when, on awakening, he noticed blurring of vision in the right eye. On examination the vision in the right eye was found to be 20/100 and in the left eye 20/20. Ophthalmoscopic study of the right eye revealed many peripheral hemorrhages from the veins, and perivascular exudation along the veins throughout the periphery of the retina. The macular region was relatively clear, although there were several small areas of exudation. There were no hemorrhages in the vitreous. The left eye was normal.

Physical examination did not reveal abnormal findings. The only positive findings were a positive intracutaneous tuberculin test using 1/20 mg., and a sedimentation rate of 55 mm. (Intravenous heparin had been given for 48 hours prior to establishing the diagnosis of Eales's disease.)

He was given 60,000 units of penicillin q.3h. for ten days and on June 7 ophthalmoscopic examination revealed marked improvement in the ocular condition, as the hemorrhages were largely absorbed and the perivascular exudate had practically disappeared. The vision in the right eye was 20/40. He felt generally well, but was confined to bed until July 7. On July 21 his shoulders began to ache and four days later he felt feverish and had malaise. On July 27 he began to notice a heavy, substernal pain on deep inspiration, aggravated by lying on his side and referred to his left shoulder. He had an unproductive cough and became nauseated and vomited at this time. A diagnosis of pericarditis with pericardial effusion and pleural effusion at the right lung base was made. During the following seven weeks he had numerous pericardial taps as well as right and left pleural taps. A guinea pig was innoculated from the pericardial tap on August 21 and the subsequent bacteriological report was positive for tubercle bacilli. Despite penicillin therapy and repeated pericardial and pleural taps, the patient's course was progressively downhill and he died on September 13, 1946.

An autopsy was performed an hour after death and both eyes were removed for microscopic study. Examination of the thoracic cavity revealed many enlarged, caseous, tuberculous glands at the roots of both lungs and between the tracheobronchial angles at both sides; some of these measured 1 cm. in diameter and were filled with caseous material. The pericardial sac contained 30 c.c. of cheesy purulent fluid. Microscopic examinations of the lungs, peribronchial lymph nodes,

heart muscle, and pericardium revealed numerous areas of caseous tuberculosis.

This is a most interesting case in that the ocular condition immediately preceded the development of fulminating tuberculosis. There was undoubtedly present a marked hypersensitivity to the tuberculoprotein.

CASE 5. This twenty-seven-year-old male complained of sudden blurring of vision in his right eye on awakening, in February, 1943. The vision was 20/120 in the eye and ophthalmoscopic examination revealed a large retinal hemorrhage in the upper temporal quadrant. Two months later he suffered a more extensive hemorrhage which involved the vitreous. A further hemorrhage occurred in June, 1943; the vision was then reduced to 20/200 and the vitreous was filled with a fine black haze. It was impossible to see the retina. There was a suggestion of beginning retinitis proliferans. The left eye was normal. Chest X ray was negative, but the skin tuberculin test was positive to 1/20 mg. intracutaneously. No specific treatment was outlined other than normal care of his general health.

Further examination in December, 1947, showed no significant change of vision in the right eye, but he noticed that the eye was divergent. In March, 1950, he was able to count fingers with the right eye in the temporal field of vision, while in the left eye the visual acuity was 20/15. No change was noted ophthalmoscopically in either eye. At a periodic observation in December, 1953, he said there was no change in his symptoms. The vision of the right eye was reduced to light perception, while that of the left eye was 20/15. The right vitreous was filled with floating opacities which did not permit an ophthalmoscopic examination of the fundus. Further X-ray examination of the chest indicated no active pulmonary disease, but there was a small calcified discrete density located in the left upper lung field in the region of the first chondrocostal junction. The skin tuberculin test was markedly positive.

This patient suffered severe massive hemorrhages in the right eye ten years ago, extending over a period of six months, after which the activity appeared to cease and there was no further apparent change. He did not receive treatment of any type other than general advice regarding his health. He has been carrying on well doing administrative work. The left eye did not become involved.

CASE 6. This thirty-two-year-old Chinese office worker was first seen in September, 1950. He complained of spots before his left eye with increasing blurring of vision. He said that in 1947 he had lost useful vision in the right eye but no treatment was carried out. In 1940 he developed pulmonary tuberculosis and was confined to bed for two

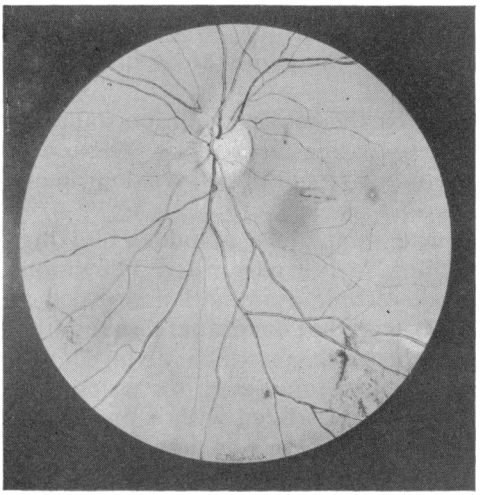

FIGURE 10. CASE 6, LEFT EYE
Active stage, with vitreous and peripheral perivenous hemorrhages and sheathing one month after onset.

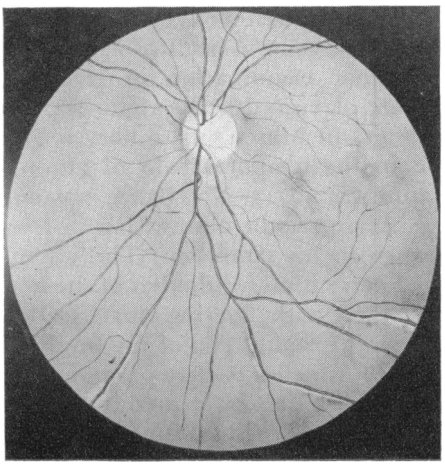

FIGURE 11. CASE 6, LEFT EYE
Four months after onset; marked perivascular exudation along veins.

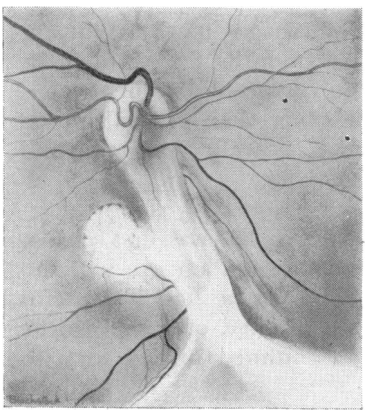

FIGURE 12. CASE 6, RIGHT EYE
Retinitis proliferans six years after onset.

years and then allowed to do full-time light work. However, the pulmonary tuberculosis recurred in 1945 and he was again confined to bed for eighteen months. The sputum examination was positive for tubercle bacilli. On examination the vision in the right eye was 20/40 and in the left eye 20/25. Ophthalmoscopic examination revealed normal disc markings in the right eye, although the margins were blurred. There was a fairly extensive area of retinitis proliferans extending from the disc margin in the lower nasal quadrant to the periphery of the retina. There were no hemorrhages. In the periphery of the lower temporal quadrant there was a whitish perivascular exudation along both sides of the veins. In the left eye the disc markings were normal. In the periphery of the retina at 2:00 o'clock there were some absorbing hemorrhages lying in the vitreous. In the upper nasal quadrant there was disorganization of the retina with perivasculitis along the vein. In the lower nasal periphery of the retina there were a number of large absorbing hemorrhages and perivascular exudation was present along the inferior veins (Figs. 10 and 11). As it was felt the ocular condition might be a hypersensitivity reaction to tuberculoprotein he was given a course of ACTH, 15 mg. q.i.d. for four weeks. No new hemorrhages were evident during this period. X-ray examination of the chest in November, 1950, showed minimal old calcified tuberculous lesions in both apices and there was no evidence of dissemination of the disease or new areas of tuberculosis following the ACTH therapy.

In January, 1952, he noticed spots before the left eye and one week later there was marked blurring of vision. Examination revealed vision in the right eye of 20/50 and in the left of 20/30. Ophthalmoscopic study of the right eye indicated several new hemorrhages in the upper temporal quadrant adjacent to the vein peripherally; there was a new hemorrhage near the disc in the lower temporal quadrant, but no change was noted in the retinitis proliferans nasally. In the left eye there were many new hemorrhages adjacent to the veins in the upper nasal, lower nasal, and lower temporal quadrants. He was again placed on ACTH therapy commencing with 10 mg. daily in 500 c.c. of 5 percent glucose intravenously, but the hemorrhages continued to develop on this regimen during the next three weeks and the dosage was increased at the fourth week to 20 mg. daily for five days, followed by 10 mg. for another 10 days. Further X rays of the chest were made in March, 1952, and June, 1953. There were no essential changes in the appearance of the lung fields when compared with the previous examinations.

During the past two years he has carried on well at his office work and has had no further hemorrhages. At the present time the vision in the right eye is 20/100 and in the left 20/30. Ophthalmoscopic examination of the right eye revealed that the upper temporal vein was

dilated and tortuous, and in the periphery the vein was sheathed and there was a whitish scarring in the extreme periphery of the retina. There was an absorbing hemorrhage near the disc in the lower temporal quadrant and in this area the veins were almost completely obliterated by whitish perivascular sheathing. Marked retinitis proliferans was present nasally and there were many vitreous opacities (Fig. 12). In the left eye the disc markings were normal but there was considerable scarring on the retina peripherally at 12:00 o'clock, and towards 1:00 o'clock beginning retinitis proliferans was present. The veins in the upper nasal quadrant were also sheathed and there was a marked whitish scarring in the extreme periphery. There was an extensive whitish scar and beginning retinitis proliferans inferiorly in the lower temporal quadrant.

This patient has had active pulmonary tuberculosis in the apices of both lungs and both eyes have been affected. During the past two years there has been no significant activity in either eye. He was treated with ACTH therapy in 1950 and 1952. The pulmonary tuberculosis is considered to be arrested.

CASE 7. This twenty-eight-year-old male complained of blurring of vision in his right eye in September, 1945, while in the army. He was admitted to hospital in February, 1946, because of recurring hemorrhages in the right eye and was periodically confined to bed for the next six months. In August, 1946, the vision in the right eye was 20/100 and in the left 20/20. Ophthalmoscopic examination indicated in the right eye a dilated vein peripherally in the upper temporal quadrant and at a bifurcation there was a fresh hemorrhage and absorbing hemorrhages were adjacent. There were a number of smaller absorbing hemorrhages in the vitreous in the upper temporal quadrant. In the upper nasal quadrant peripherally there were numerous new capillary formations at the site of a previous massive hemorrhage into the vitreous and retinitis proliferans was developing. There were many unabsorbed hemorrhages in the vitreous inferiorly. Fresh hemorrhages could be observed on the posterior surface of the lens. The retinal findings were normal in the left eye.

Physical examination revealed bronchiectasis involving the posterior segment of the left lower lobe and primary tuberculous disease focus of a Ghon tubercle formation. The pulmonary condition was apparently healed by August, 1948. He carried on with his work as a shipper and reported for periodic examination of the eyes and chest every six months during the following years.

There were no further vitreous hemorrhages until October, 1949, at which time the vision of the right eye suddenly became blurred. On examination in May, 1951, the vision in the right eye was 20/50 and in the left 20/15. Ophthalmoscopic examination of the right eye indi-

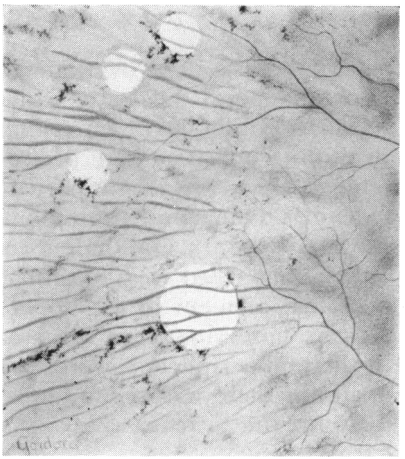

FIGURE 13. CASE 7, RIGHT EYE
Inactive, healed stage; peripheral retina eight years after onset.

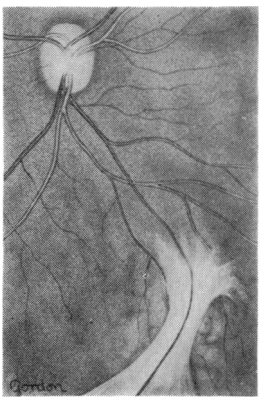

FIGURE 14. CASE 7, RIGHT EYE
Retinitis proliferans eight years after onset.

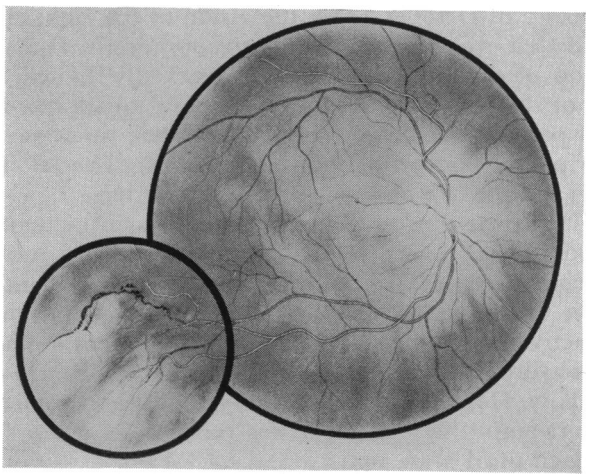

FIGURE 15. CASE 8
Active stage, with peripheral venous varicosities and exudation.

cated a diffuse depigmentation in the periphery of the retina in the upper temporal quadrant, while in the lower nasal retina there was retinitis proliferans which extended to the mid-periphery of the retina. Beginning opacities were present in the lens. He was last seen in December, 1953, when he reported slight haziness in his right eye in the mornings. On examination the vision in the right eye was 20/30 and in the left eye 20/15. Ophthalmoscopic study revealed numerous punched-out circumscribed areas of retinal degeneration and conglomerations of choroidal pigment in the upper temporal quadrant. There was a fine vitreous haze in front of this area. There was a large punched-out area in the mid-periphery towards 9:00 o'clock (Fig. 13). In the lower nasal quadrant there was beginning retinitis proliferans with a vein extending into the vitreous (Fig. 14). No abnormalities were noted in the left retina.

This patient has been followed for eight years and although marked activity was present at the outset with numerous vitreous hemorrhages, he was free of these until a further hemorrhage occurred in 1949 and since then there has been no recurrence. Physical examination revealed a healed pulmonary tuberculosis and bronchiectasis.

CASE 8. This twenty-five-year-old male was first seen in October, 1950. He complained of marked blurring of vision in his left eye. One year previously he had noticed a transient blurring of vision in the left eye and in March, 1950, there had been a sudden hemorrhage in the eye. In May the vision had been almost completely lost because of another hemorrhage in the eye and he was admitted to hospital. He was given intramuscular cortisone for one month, following which cortisone was instilled topically for two weeks. There was no improvement of vision in the left eye. In October, 1950, the vision of the right eye was 20/15 while in the left eye there was light perception only. Ophthalmoscopic examination of the right eye revealed markedly dilated veins in the periphery of the retina in the lower temporal quadrant, with a small amount of perivascular hemorrhage. There were numerous varicosities in the peripheral portion of the vein (Fig. 15). The left retina could not be seen because of a massive vitreous hemorrhage.

The skin tuberculin test, using 1/20 mg. intracutaneously, was strongly positive, and X rays of the chest revealed a number of fine discrete hard densities in the right mid-lung zone and numerous opacities in the apices of both lungs. The chest consultant diagnosed healed inactive pulmonary tuberculosis. Treatment in hospital consisted of di-hydro streptomycin, 1½ Gm., and para-amino salicylic acid, 7½ Gm., daily. However, after six weeks nausea and vomiting resulted and the para-amino salicylic acid was reduced to 4 Gm. This dosage was continued until May, 1951.

No further hemorrhages occurred in the right eye but there was no

significant improvement in the visual acuity of the left eye and he was discharged from hospital. In January, 1954, the vision had improved to 20/60 in the left eye while in the right eye it was 20/20. The lower temporal vein in the right eye showed some tortuosity and dilatation and there were adjacent areas of scarring, but no hemorrhages. The left fundus showed considerable scarring in the lower temporal retina peripherally with slight tortuosity and dilatation of the vein but no hemorrhages.

This condition had a period of marked activity for about one year and it was considered that it had been held in check following the extended period of treatment. He had had healed minimal tuberculosis in both lungs which resulted in a state of hypersensitivity to tuberculoprotein.

CASE 9. This thirty-six-year-old army veteran was admitted to hospital in March, 1948. He stated that six days previously on awakening he noted a hemorrhage under the skin at the back of his left knee and one half hour later the vision of the left eye suddenly became very blurred. He had been a prisoner of war in Japan for four years and was treated for dysentery and beri-beri. While a prisoner of war he was in contact with several cases of pulmonary tuberculosis.

On examination the vision in the right eye was 20/20, but he was able to perceive light only in the lower field of the left eye. The right eye was normal while in the left eye it was difficult to visualize the fundus because of a massive hemorrhage in the vitreous.

Physical examination revealed a large subcutaneous hemorrhage behind the left knee and enlargement of the liver. The bleeding, clotting, platelet count, liver function, and agglutination tests were normal. The intracutaneous tuberculin test was markedly positive to 1/20 mg. X ray of the chest indicated a pleuritic thickening of the left diaphragm and the costophrenic angle was obliterated. The chest consultant felt that this might be tuberculous. He was confined to bed for one month, then allowed to return to light work.

In May, 1948, it was noted that there was a small detachment of the retina in the lower temporal quadrant peripherally in the right eye with a disinsertion extending from 6:00 to 8:00 o'clock, and he was admitted to hospital for one week for complete bed rest with the eyes covered. In November, 1948, two small holes could be seen far out in the periphery of the right eye at 7:00 o'clock, but the retina seemed to be fairly well back in position.

He carried on with his farm until December, 1948, but complained of easy fatigability and aching pains in the right upper quadrant of the abdomen. During this period he had four hemorrhages into the skin of the right leg and two hemorrhages about the left knee. He returned for periodic ophthalmoscopic examinations; in January, 1949, the

vision of the right eye was 20/20 while he was able to count fingers with the left eye. The left fundus was observed more clearly than it had been previously and the retina around the disc appeared normal. The blood vessels were markedly dilated and there was extensive rete mirabile into the vitreous. A greyish mass was noted nasally and below. Further observation was carried out in July and December, 1949, without significant change.

He was admitted to hospital in December, 1949, for biopsy of the liver which revealed portal cirrhosis secondary to hepatitis. In May, 1951, a tender swelling on the right side of the knee measuring 1 cm. in diameter was removed. Study of the sections revealed focal collections of lymphocytes in the dermis while in the subcutaneous tissues there were foci of polymorphonuclear leucocytes. Throughout the fat and alveolar tissue there were recent hemorrhages, but the walls of the capillaries and arterioles were intact.

Eye examination in December, 1953, showed that the vision in the right eye was 20/20 while in the left eye the vision had improved to 20/200. There were no changes in the right retina while in the left eye the vessels round the disc were normal. There were many vitreous opacities throughout the periphery which obscured the retina. X ray of the chest was negative but the skin tuberculin test remained markedly positive.

This patient has been followed for five and a half years. He suffered great hardships as a prisoner of war for four years, during which time he had severe beri-beri and dysentery. The liver became enlarged from portal cirrhosis and there was residual peripheral polyneuritis. It is difficult to relate the hemorrhages in the skin and the thighs with those in the eye. The ocular hemorrhages are characteristic of the Eales's disease syndrome in the presence of a strongly positive skin tuberculin test and healed minimal pulmonary tuberculous condition.

Case 10. This twenty-two-year-old nurse complained of sudden blurring of vision in her left eye in April, 1952, one week after she had been vaccinated with BCG vaccine (20 mg. per c.c.). The vision in the left eye cleared up in three weeks. The skin tuberculin test was negative in March, 1952, but became positive in June, 1952, using 1/20 mg. old tuberculin. The chest X rays were negative. In November, 1953, she had a further blurring of vision in her left eye and was admitted to hospital. Ophthalmoscopic examination of the right eye revealed in the upper temporal retina peripherally a marked whitish scarring extending from 11:00 o'clock down to 8:00 o'clock. The retinal veins were dilated more than usual in the mid-periphery and as they entered the whitish scarring, perivascular sheathing was present. Towards 8:00 o'clock one of the venules had a large loop inferiorly, but there were no significant vitreous opacities (Fig. 16). In the left eye was a

large vitreous opacity which was obscuring part of the fundus. From 2:00 to 4:00 o'clock there was a white area at the extreme periphery of the retina and towards 4:00 o'clock there was a fresh hemorrhage in the periphery of the retina adjacent to a vein. Three weeks later there was a much larger hemorrhage into the vitreous of the left eye so that

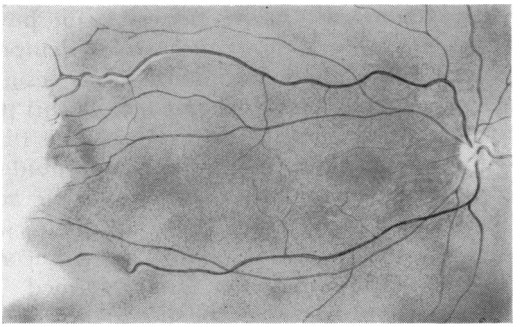

FIGURE 16. CASE 10
Precursor stage; peripheral exudation and perivascular sheathing, no hemorrhages.

only a grey reflex was obtained, and she was only able to perceive hand motion. The ophthalmoscopic findings in both eyes had not changed significantly two months later.

This patient raises an interesting conjecture in regard to the first vitreous hemorrhage following the BCG vaccination. The tuberculin test was negative before the BCG vaccination, following which it became positive. It would appear that the vaccine may have been responsible for the massive hemorrhages from the veins in the left eye owing to the development of a state of hypersensitivity. Further observation will be required to determine whether the condition in the right eye is the precursor to hemorrhage in the eye. There is no doubt that the condition is active at the present time.

CASE 11. This forty-one-year-old salesman had sudden blurring of vision in his left eye in August, 1947, while eating a meal, and within 45 minutes the vision was practically gone. He consulted his oculist, who advised good food and general exercise with the avoidance of lifting, and within a few weeks the vision returned to normal so that he was unable to detect a difference in the vision between the two eyes. In March, 1948, he had a second hemorrhage in the left eye and ophthalmoscopic examination revealed hemorrhages scattered over the fundus chiefly in the periphery. In the right eye peripheral periphlebitis was noted temporally. A number of smaller hemorrhages followed in the left eye, but gradually the vision cleared to normal. At

this time it was noted that there was an enlarged cervical lymph gland on the left side of the neck. Otherwise physical examination, blood studies, and chest X rays were all negative, but there was a positive skin tuberculin reaction. A year later there was another hemorrhage and tuberculin desensitization was started but was discontinued in August, 1949, following a hemorrhage in the left eye. Tuberculin therapy was again commenced in December, 1949; however, at the second injection there was swelling of the cervical lymph node in the neck and the tuberculin was discontinued. It was resumed a month later and he had a further vitreous hemorrhage. At this point a promizole was used for 4 weeks and as there was no change this was discontinued. In March, 1950, he was given a course of typhoid vaccine intravenously. Later in the same year para-amino salicylic acid, 7½ Gm., and streptomycin, 1½ Gm., were taken by mouth for 14 weeks, but discontinued because of nausea. In May, 1950, acute glaucoma developed in the left eye and a filtering operation was performed. There was no light perception in the left eye following the glaucoma operation. In December, 1950, cortisone was given systemically.

He said that he had noticed a spot before the right eye since 1949, but there was no blurring of vision. In May, 1952, the vision in the right eye was 20/20, while in the left eye there was no light perception. Ophthalmoscopic examination of the right eye revealed a few vitreous opacities and in the upper temporal retina peripherally there was scarring with narrowing of the veins. Acute secondary glaucoma was present in the left eye and it was enucleated at this time.

In January, 1954, the vision in the right eye was 20/15. Ophthalmoscopic examination revealed normal findings throughout the fundus except in the upper temporal quadrant in the periphery. Here two terminal venules were markedly narrowed and one of them terminated in a series of dilated convolutions. There was a small partially absorbed

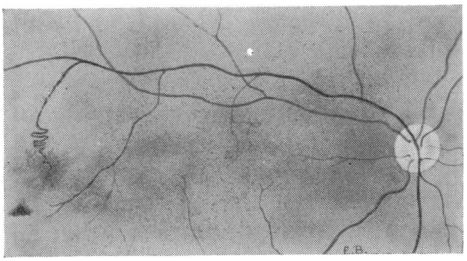

FIGURE 17. CASE 11
Peripheral venous tortuosity with absorbing hemorrhage.

hemorrhage above the lower terminal vein and beading of the terminal venule proximal to the dilated convolutions (Fig. 17).

Although no evidence of tuberculosis was discovered it is possible that the left cervical lymph adenopathy may have been tuberculous in view of the two episodes of sudden enlargement of the gland following

old tuberculin therapy. He had had three close contacts in his youth who died from pulmonary tuberculosis, and it is probable that a hypersensitivity to tuberculoprotein resulted. The activity in the left eye extended over a five-year period with numerous hemorrhages which appeared to be more frequent following tuberculin therapy. The activity in the right eye was minimal throughout and at present it may be considered as inactive, healed. During the past two years he has been a sales executive in a large company, but has been careful in his mode of living and has maintained his general health, having adequate sleep, with a good nourishing diet.

Case 12. This thirty-year-old pilot complained of blurring of vision in his left eye in November, 1944, while overseas. The visual acuity was 20/15 in the right eye and 20/20 in the left eye. Ophthalmoscopic examination of the left eye revealed numerous fine vitreous opacities and there were numerous hemorrhages in the peripheral retina near the veins temporally and inferiorly. It was thought that he had a thrombosis of the vein and he was placed on dicoumarin, 100 mg. daily. The vitreous hemorrhages increased after ten days on this therapy and the dicoumarin was discontinued. The vision in the left eye continued to deteriorate and examination in December, 1944, indicated the vision of the left eye to be 3/200. The left fundus could not be seen except in the periphery, where many retinal hemorrhages were present. The vitreous was filled with a large hemorrhage. Two weeks later the vision had improved to 20/100 in the left eye. Physical examination did not reveal any abnormalities except for a positive skin tuberculin test to 1/20 mg. old tuberculin, and a bilateral pyelitis from which *Bact. coli* were cultured.

A further hemorrhage occurred in the left eye in April, 1945, which reduced the vision to hand movement. Retinitis proliferans began to develop, involving the whole vitreous. In February, 1945, tuberculin desensitization was started. However, the condition of the left eye deteriorated and the tuberculin was discontinued in April, 1946. All vision was lost in the eye by July, 1948, and it was removed because of recurrent iridocyclitis.

In 1951, when he developed severe diarrhea with bloody stools, a diagnosis of idiopathic ulcerative colitis was made. At the present time his main physical complaint is the continued diarrhea and general lack of good health. X-ray examination of the chest was done on many occasions from the time of his enlistment in 1937 until the present time and no significant abnormality was noted other than a Ghon tubercule in 1945.

Observation of the right eye was carried out twice a year and the vision in the right eye continues to be 20/15 with no abnormality in the retina.

This condition had a period of marked activity over a four-year period from 1944, with complete loss of vision in his left eye and ultimate removal of the eye. It is interesting to speculate upon the relationship that may exist between the ulcerative colitis and the retinal hemorrhages.

CASE 13. This thirty-four-year-old salesman noticed sudden blurring of vision in his left eye in April, 1945, while lifting a roll of linoleum, and in the following three months the vision improved only slightly. In March, 1946, he had moderate blurring of vision in the right eye. Physical examination, X rays of chest, sinuses, and teeth were negative, but the tuberculin test to 1/20 mg. was positive. In August, 1946, tuberculin desensitization was started and in October the vision in the right eye was 20/40 with hand movements only in the left eye. Ophthalmoscopic examination indicated in the right eye recent large hemorrhages temporally and in the periphery retinitis proliferans was present superiorly. There was a large, partially absorbed hemorrhage in the vitreous. In the left eye only a red reflex was obtainable owing to a massive vitreous hemorrhage.

Over a ten-day period in November, 1946, 1,050 roentgen units of high-voltage X-ray therapy were given to the posterior segments of both eyes through two portals and in February, 1947, 3,500 roentgen units were repeated to both eyes by the same method. A month following the last X-ray treatment he had a large hemorrhage in the right eye. The vision in the left eye decreased further but the right eye gradually improved.

He had a further hemorrhage in the right eye in February, 1948, and was unable to carry on with his work and remained away from work for four months. He had smaller hemorrhages in the right eye in November, 1948, and February, 1949. During the next three years he had small recurrent hemorrhages in the right eye every three or four months. Since March, 1952, he has had numerous large and small hemorrhages in the right eye with gradual impairment of vision after each hemorrhage until a serious hemorrhage occurred at the end of December, 1953.

In January, 1954, the vision in the right eye was reduced to the perception of fingers and to 20/200 in the left eye. The right eye was deviated outward 15 degrees. Ophthalmoscopic examination indicated a red reflex in the right eye with numerous fibrous bands in the vitreous. No details of the retina could be observed. In the left eye only a grey reflex was present.

His general health has been excellent throughout the ocular illness and he has had repeated X rays of the chest which have been negative. This patient had an active lesion for the past ten years which has still not healed. He noticed that sudden changes in temperature were fre-

quently followed by a further hemorrhage. He has also noticed that the hemorrhages have occurred after a period of emotional distress, on awakening, and after taking a hot bath. It is interesting to speculate on the association between fluctuations in body temperature with the weather and emotional disturbances and the occurrence of the vitreous hemorrhages.

CASE 14. This twenty-six-year-old veteran was seen in April, 1946. He stated that three days previously the right eye had become markedly blurred when walking. There was a fresh hemorrhage in the vitreous of the right eye, obscuring the details of the retina especially in the periphery of the lower nasal quadrant. The vision was less than 10/400. He was confined to bed rest for a month. The skin tuberculin test was markedly positive to 1/20 mg. intracutaneously. The chest X rays were negative and physical examination was also negative. After bed rest the vision was 20/25 in the right eye and 20/20 in the left eye. In August, 1946, the vision had improved to 20/15 in both eyes but ophthalmoscopic examination indicated perivascular exudation along the veins in the lower nasal quadrant of the right eye to the periphery and there appeared to be slight elevation of the retina suggestive of retinitis proliferans. At 4:00 o'clock in the periphery there was a large absorbing hemorrhage adjacent to one of the veins. There were many vitreous opacities. No abnormality was noted in the retina of the left eye. He returned for periodic examination during the following year. There were two further hemorrhages into the vitreous of the right eye in January and October, 1947, but none have occurred since that time. On each occasion without warning the vision suddenly blurred but gradually cleared almost to normal during the following ten days.

In November, 1947, the vision was 20/25 in the right eye and 20/15 in the left eye. There was a diffuse glial proliferation around the terminal branches of the veins in the lower nasal quadrant of the right eye and retinitis proliferans was present. In the left retina in the midperiphery of the lower nasal quadrant a thin whitish sheathing adjacent to the vein was apparent. Immediately distal to this area there was a segment of a vein, approximately two disc diameters in length, which was dilated, and there was a small loop present; however, no signs of hemorrhage in the retina and vitreous were noted in the left eye. It was thought that the condition in the left eye might be the precursor to vitreous hemorrhage.

In May, 1948, the vision was 20/20 in the right eye and 20/15 in the left eye. There were three small choroidal pigmentary deposits in the right upper temporal retina peripherally. The retinitis proliferans in the lower nasal quadrant had extended almost to the disc. No change was apparent in the condition of the lower nasal retinal vein in the left eye and there were no signs of hemorrhage. In December, 1953,

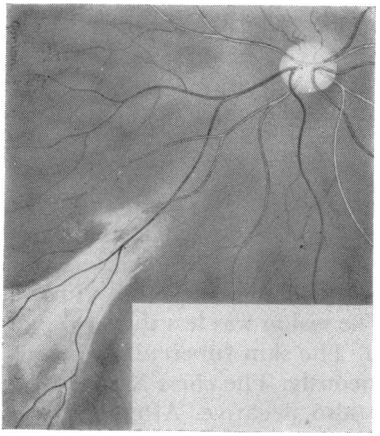

FIGURE 18. CASE 14, RIGHT EYE
Inactive, healed stage, showing retinitis proliferans.

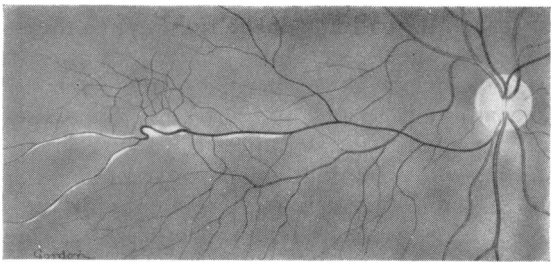

FIGURE 19. CASE 14, LEFT EYE
Precursor stage; perivenous exudation, looping, no hemorrhages.

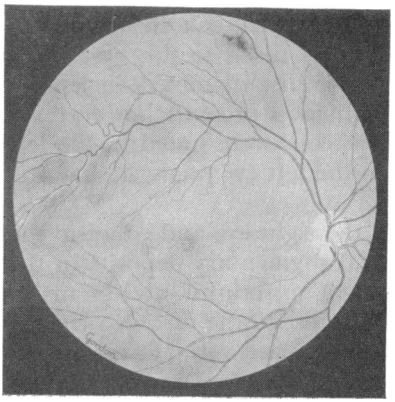

FIGURE 20. CASE 15
Active stage; peripheral hemorrhage and perivascular exudation.

the vision in the right eye was 20/20 and in the left eye 20/15. In the upper temporal quadrant of the right eye there was an area of depigmented retina which had a stippled effect extending from 11:00 to 8:00 o'clock, and there were numerous conglomerations of choroidal pigment in this area. In the lower nasal quadrant there was marked retinitis proliferans with whitish strands along the vessel to the extreme periphery (Fig. 18). In the left eye the lower nasal vein was dilated in the mid-periphery and there was a large loop present in the vein superiorly to which there were numerous small capillaries (Fig. 19). Distal to the loop, the vein remained dilated and there was perivascular sheathing to the periphery.

This young man apparently had a period of activity of this condition of about one and a half years, and since then the condition has been quiescent. He has been under frequent observation for approximately seven and a half years. No signs of pulmonary tuberculosis were present but the skin tuberculin reaction was strongly positive using 1/20 mg. intracutaneously. The lesion in the left eye may have been the precursor to an active periphlebitis which became arrested.

CASE 15. This twenty-six-year-old veteran noticed lines across the vision of the left eye in November, 1943. He suffered almost complete sudden loss of vision in the left eye in April, 1944, so that he could only count fingers. In July of that year he awakened with loss of vision in his right eye. Complete bed rest was instituted for one month and convalescent care for a further two months. A course of tuberculin desensitization was commenced in October, 1944. However, he had another hemorrhage in the right eye in November of that year but the vision was correctable to 20/30. The tuberculin desensitization was continued through 1945. In August, 1945, the vision of the right eye was 20/30, while that of the left eye was the perception of hand motion. In November, 1946, there were numerous small newly formed vessels superiorly in the retina of the right eye and perivascular sheathing in the temporal retina peripherally. In the left eye the vitreous was considerably clearer and an extensive area of disseminated chorioretinitis in the temporal retina and macula was noted. In March, 1949, several small retinal hemorrhages adjacent to the upper temporal vein peripherally in the right eye were observed. In April, 1951, the vision in the right eye was 20/20; using the left eye, he could only count fingers. There was extensive perivascular exudation in the periphery of the right retina superiorly and there was a small whorl of fine capillaries extending into the vitreous at this point. In November, 1953, the vision in the right eye was 20/20, but using the left eye he could only count fingers in the temporal field. There were small absorbing hemorrhages in the upper portion of the right retina temporally close to a small venule; the adjacent peripheral veins were sheathed (Fig. 20). In

the left eye there was central scarring in the posterior retina extending temporally to the periphery with depigmentation and conglomeration of choroidal pigment.

The skin tuberculin test was positive in 1945 to 1/20 mg. intracutaneously and again in November, 1953. The physical examination, chest X rays, blood studies, and so on were negative. This patient was confined to bed for three months at the beginning of the illness and had several prolonged courses of tuberculin desensitization. The illness is inactive at the present time. He has been carrying on satisfactorily as a brakeman on the railroad during the past ten years.

CASE 16. This twenty-one-year-old veteran complained of blurring in his left eye in February, 1944, which lasted four days and then cleared, but was followed by further blurring three months later. During the ensuing year he had five spontaneous attacks of blurred vision, the last one being three months prior to the first ophthalmoscopic examination in April, 1945. At this time the vision in the right eye was 20/15 and in the left 20/120. There was no abnormality in the right eye but in the left eye there was a fine vitreous haze and retinitis proliferans was present, extending into the vitreous above and below the disc. In the inferior portion of the vitreous there was a group of newly formed vessels and a partly absorbed hemorrhage. The physical examination, chest X rays, complete blood studies, and so on were negative, except for a positive tuberculin test to 1/20 mg. intracutaneously. He was confined to bed for five weeks. In June, 1945, no new hemorrhages were noted in the left eye, but there was a complete detachment of the retina except in the upper nasal quadrant. The vision in the left eye was reduced to perception of hand motion. In May, 1948, the vision in the right eye was 20/15 but the left eye was turning outward fifteen degrees and the vision was reduced to the perception of hand motion. There was posterior lens opacity in the left eye.

In November, 1953, the vision in the right eye was 20/15 and there were no abnormalities noted in the fundus. He was able to perceive hand motion with the left eye and there was a completely white cataract present. A faint red reflex was obtained nasally where the lens was partially dislocated. The intraocular pressure was 22 mm. Hg (Schiötz) in the right eye and 27 mm. Hg (Schiötz) in the left eye. The skin tuberculin test was now negative to 1/20 mg. intracutaneously.

This patient received no active treatment other than bed rest for a five-week period in 1945. There have been no signs of tuberculosis during the past ten years except that a positive skin tuberculin test was found in 1945, but this subsequently became negative in 1953.

CASE 17. In January, 1953, this thirty-year-old physician had slight blurring of vision in his right eye nasally while reading. He consulted

an oculist, who noted a large preretinal hemorrhage in the periphery of the retina in the lower temporal quadrant. The visual acuity was 20/20. Three weeks later he had a more severe hemorrhage with almost complete loss of vision in the eye. He was confined to bed for 10 days and was treated by systemic cortisone, 100 mg. daily for 10 days, then 75 mg. a day until June, 1953. He continued with 50 mg. for three months, after which he took 25 mg. of cortisone daily for the following five months.

The vision in the right eye gradually improved to 20/40 in May, 1953. In January, 1954, the vision in the right eye was 20/20 and 20/15 in the left eye. Ophthalmoscopic examination revealed in the right eye a partly absorbed hemorrhage in the retina nasally in the periphery on both sides of a narrowed venule. There were many greyish-white vitreous opacities inferiorly. There were no signs of abnormality in the left retina.

The physical examination was negative in all respects, except for a positive skin tuberculin test to 1/20 mg. intracutaneously. The skin tuberculin test had been negative prior to 1945. It is of interest that he was closely associated with two individuals who developed active pulmonary tuberculosis while he was working with them. At the present time it is probable that the disease is inactive and healed.

CASE 18. This twenty-two-year-old Japanese laborer stated that in September, 1947, he awoke to find that he could not see with his left eye. On examination the vision in the right eye was 20/15 and 20/400 in the left eye. The right retina was normal but in the left eye the vitreous was hazy and there was diffuse blood and hemorrhages along the superior temporal vein. Two days later there was a marked perivascular exudation along the wall of the vein. The skin test to 1/100 mg. tuberculin intracutaneously was positive. Six weeks later the vision in the left eye had decreased to perception of fingers. In December, 1947, he was placed on tuberculin desensitization but in January, 1948, further severe hemorrhage occurred in the left vitreous. By April, 1948, only a black reflex was obtained ophthalmoscopically in the left eye, although good light projection was present. In January and February, 1949, only light perception was present in the left eye and a diffusely dark reflex was obtained ophthalmoscopically. The veins in the right eye were normal.

The patient moved away shortly after the last examination and no further observations were possible. A complete medical examination did not reveal significant abnormalities except for the strongly positive skin tuberculin test.

CASE 19. This thirty-year-old veteran was seen in November, 1946. He stated that three days previously he had noticed a floating shadow in

front of the right eye. He had had swollen glands in the neck as a child for several weeks, but it had not been ascertained whether these were tuberculous. The vision in the right eye was 20/80 and 20/20 in the left eye. There was a fresh hemorrhage into the vitreous of the right eye supero-temporally which was tracking inferiorly. Six days later the right retina could be observed and in the periphery of the upper temporal quadrant there was a dilated vein with an adjacent area of whitish exudation, distal to which the venules appeared to be collapsed. Three weeks later marked dilatation of the lower temporal vein was observed. In May, 1947, while reading he noticed a black streak coming down before the right eye, and a long scroll-like clot was seen in the cloudy vitreous. The hemorrhage appeared to be coming from the upper temporal retina at the site of the previous bleeding. The vision gradually cleared and in November, 1947, the visual acuity was 20/25 in the right eye and 20/20 in the left eye. In May, 1948, an absorbing hemorrhage in the right vitreous was noted. The superior retina was disorganized and retinitis proliferans was present. No abnormalities were noted at any time in the left retina.

In November, 1953, the vision was 20/20 in each eye although there had been another hemorrhage in the right eye four months previously. In the upper temporal quadrant of the right retina there were a number of whitish scars and at 11:00 o'clock there were several newly formed capillaries which were proliferating into the vitreous. There was considerable scar tissue at this point. At 9:00 o'clock there was a

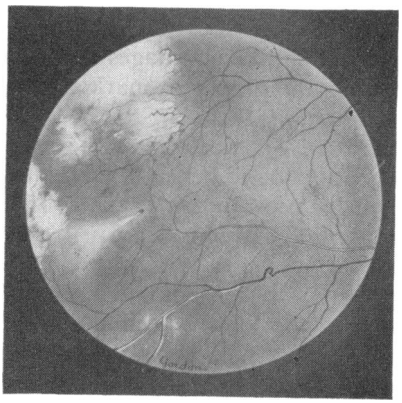

FIGURE 21. CASE 19
Inactive, healed stage, seven years after onset, showing peripheral scarring and perivascular sheathing.

large vitreous opacity and numerous scars were present in the retina peripherally (Fig. 21). In the lower temporal quadrant there was tortuosity of the vein with fairly marked perivascular sheathing, and at one point the venule was thread-like for an extensive distance. There were no signs of new hemorrhages. The left retina was normal.

This patient's skin tuberculin test was strongly positive in 1945 and

again in November, 1953, to 1/20 mg. intracutaneously. The physical examination, chest X ray, blood studies, and so on were negative at numerous examinations.

CASE 20. This thirty-one-year-old veteran complained of a blur in the right eye in April, 1945. The vision was 20/20 in each eye and in a few days the blur disappeared, leaving only a few spots before the right eye. In January, 1947, the right eye became blurred again and many hemorrhages were observed adjacent to the lower nasal vein peripherally and in the vitreous. Physical examination, chest X ray, blood studies, and so on were negative except for chronic tonsillitis. The tonsils were removed and 5 mg. vitamin K per day for two months was prescribed. During the next four months the hemorrhage in the right eye partially absorbed.

In May, 1948, he had further blurring of the right eye, although the vision was 20/20 in each eye. In the right eye a large hemorrhage into the vitreous in the lower nasal quadrant obscured the fundus. There were several small hemorrhages close to the lower temporal margin of the right disc. There was a longitudinal hemorrhage in the retina in the lower temporal quadrant, but the retina more peripherally was obscured. In the left retina numerous hemorrhages were observed near a vein peripherally at 3:00 o'clock.

In December, 1948, he had further blurring of the right eye on awakening. Below the right disc there were several small hemorrhages

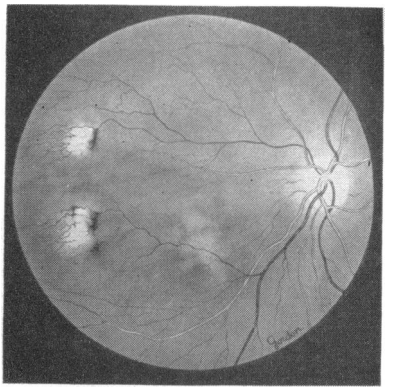

FIGURE 22. CASE 20
Whorls of newly formed venules five and a half years after onset.

which became more profuse in the lower nasal quadrant. Retinitis proliferans with neovascularization into the vitreous in the lower nasal quadrant was developing. In the left eye there were several large hemorrhages peripherally at 3:00 o'clock.

In July, 1949, the vision in the right eye again blurred but cleared up somewhat in three days. The vision remained 20/20 in the right eye

and 20/15 in the left eye. A new vitreous hemorrhage was found in the lower nasal quadrant. In November, 1949, he was hit in the right eye by a piece of wood and there was sudden loss of vision. The right fundus could not be seen because of the massive vitreous hemorrhage. The vision in the right eye continued to deteriorate so that in March, 1950, he could only perceive hand motion and an intense black reflex was present. Eight months later a faint red reflex was present but he could only see hand motion in the temporal field.

During the next three years there was no change in the ocular symptoms. In November, 1953, the vision was hand motion in the lower temporal field of the right eye and 20/15 in the left eye. The right retina was detached superiorly where a faint red reflex was present. In the left eye there were numerous whorls of capillaries and neovascularization nasally (Fig. 22).

The patient's physical condition is excellent, but the skin tuberculin test remains markedly positive to 1/20 mg. intracutaneously.

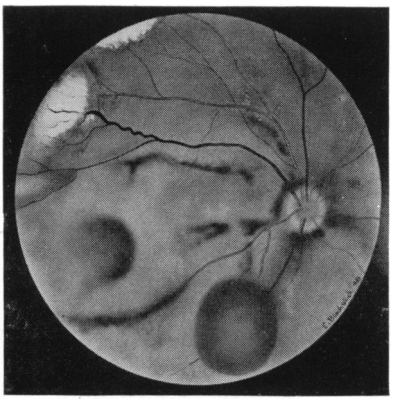

FIGURE 23. CASE 21, RIGHT EYE
Active stage, with peripheral hemorrhages in retina and vitreous at onset.

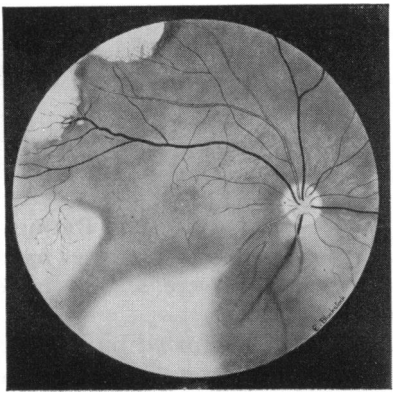

FIGURE 24. CASE 21, RIGHT EYE
Five months after onset.

CASE 21. This twenty-five-year-old salesman was first seen in November, 1947. Five days previously he had noticed spots in front of the right eye and the following day the vision became misty. The vision in both eyes was 20/20. In the right eye there were two large hemorrhages in the vitreous which appeared to be coming from the superior temporal vein peripherally; this vein was markedly dilated and tortuous and there was extensive perivascular sheathing in the periphery of the retina (Figs. 23 and 24). There were numerous small hemorrhages in the vitreous adjacent to the vein peripherally. The physical examination, chest X ray, blood studies, and so on were negative, but the skin tuberculin test was positive to 1/20 mg. intracutaneously. He was confined to bed for four weeks and the mistiness of vision in the right eye cleared. In addition he was given 20 mg. rutin t.i.d. and 50 mg. of ascorbic acid daily for three months while convalescing. Six weeks later he had a further hemorrhage into the vitreous so that the retina was obscured. In three months the vision had improved to 20/20 but in March, 1948, he had another hemorrhage and only a red reflex was obtainable, the vision being reduced to hand motion. Again he was confined to bed for a month but further hemorrhages occurred spontaneously while in bed. In June, 1948, tuberculin desensitization was commenced but in July he had another vitreous hemorrhage and went to bed for three weeks. The tuberculin injections were continued until May, 1949, at which time he had another vitreous hemorrhage and this treatment was discontinued.

During the past two years no further hemorrhages have occurred

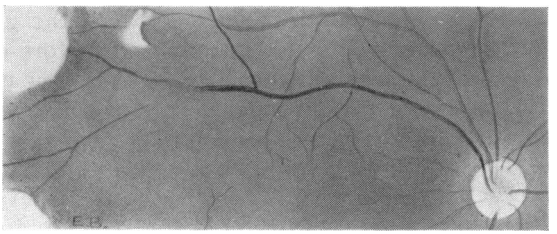

FIGURE 25. CASE 21, RIGHT EYE
Five years after onset; narrowing of vein, with peripheral scarring.

and the vision is 20/20 in each eye. There is marked dilatation of the superior temporal vein in the right eye in the mid-periphery, distal to which the vein is almost completely obliterated by perivascular sheathing and scarring (Fig. 25).

This case of Eales's disease has shown no signs of activity during the past five years, although there were numerous recurrent hemorrhages into the vitreous previously in the right eye. The left eye was normal.

CASE 22. This twenty-six-year-old veteran noticed spots before his left eye in May, 1945; they gradually cleared in two months. In November, 1945, hemorrhages were noted in the left retina temporally. The visual acuity was 20/20 in the right eye and 20/25 in the left eye. Physical examination, chest X ray, blood studies, and so on, were negative, except for chronic tonsillitis. The tonsils were removed. He was confined to bed for four months but in January, 1946, a further hemorrhage occurred in the left eye. Tuberculin desensitization was commenced but more vitreous hemorrhages occurred in the left eye and the vision was reduced to light perception by June, 1946.

In June, 1948, the vision was 20/20 in the right eye and 20/100 in the left eye. The left eye was beginning to turn outward and the iris had become pale. No abnormalities were noted in the right eye but in the left eye the retinal markings were blurred owing to the vitreous opacities. There were two strands running superiorly in the upper temporal quadrant to the periphery, suggesting beginning retinitis proliferans. In May, 1950, there was no change in the vision of the left eye and the retina could not be observed.

In December, 1953, he said that he had had no further hemorrhages in the left eye. The vision was 20/20 in the right eye and 20/200 in the left eye. The left eye was turning outward 20 degrees. There were no abnormalities of the right retina, but the details of the left fundus were obscured owing to an increase in the lens opacities.

This veteran had recurrent hemorrhages in the left eye over a five-month period in 1945 and 1946. Since then there have been no further signs of activity. His general health had always been good until May, 1950, when he developed chronic cholecystitis and the gall bladder was removed. There were no further hemorrhages before or after the liver disease. The treatment consisted of bed rest for four months during the period of recurrent hemorrhages. The skin tuberculin test was positive at the onset and it is still positive to 1/20 mg. tuberculin intracutaneously.

CASE 23. This twenty-eight-year-old veteran noticed blurring of vision in his right eye in October, 1951, while driving his automobile. The vision was 20/15 and there was a faint haze in the vitreous due to bleeding from the peripheral temporal veins. He was confined to bed for three weeks and placed on 100 mg. of cortisone daily by mouth for two months. A further hemorrhage occurred in the right eye six weeks later and he went to bed again for three weeks. He had four more hemorrhages in the right eye between January and July, 1952. In May, 1952, a diathermy coagulation operation was carried out in the upper temporal quadrant of the sclera over an area of retinal hemorrhage in the right eye. However, six or seven larger hemorrhages occurred between January and July, 1953, and on each occasion he

went to bed for three weeks to allow the bleeding to absorb. In June, 1953, a further diathermy operation was performed over the upper temporal quadrant of the sclera of the right eye.

In August and September, 1953, he had two more hemorrhages in the right eye and returned to bed for three or four days on each occasion. Smaller hemorrhages occurred in the right eye in November and December, 1953. In December, 1953, the vision was 20/20 in both eyes. There were numerous conglomerations of choroidal pigment in the periphery of the retina in the right eye in the upper temporal quadrant and several small absorbing hemorrhages were seen at 9:00 o'clock adjacent to a small venule which was markedly narrowed and sheathed (Fig. 26). The left eye was normal.

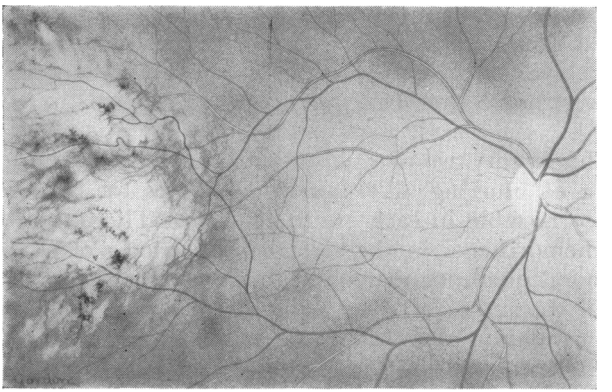

FIGURE 26. CASE 23
Active stage; partially absorbed hemorrhages peripherally, with scarring.

Physical examination, chest X rays, blood studies, and so on were negative. The skin tuberculin test was strongly positive to 1/20 mg. intracutaneously.

This patient had numerous large hemorrhages into the vitreous of the right eye from the peripheral temporal veins. Two diathermy coagulation operations were done but the hemorrhages continued. However, no retinitis proliferans had developed and the visual acuity has remained normal in the eye. It is probable that there is still activity present.

CASE 24. This thirty-eight-year-old physicist noticed a sudden blurring of vision in his right eye while on a streetcar in December, 1946. The vision rapidly decreased so that when he was examined two hours later he was only able to perceive fingers at a distance of 3 feet. The vision of the left eye was 20/20. In the right eye the vitreous was cloudy and

a dark reddish mass was noted in the lower nasal quadrant. Toward 3:00 o'clock at the periphery large flame-shaped hemorrhages could be seen through the vitreous haze. He was confined to bed for four weeks and the vitreous cleared rapidly. The chest X rays were negative and there was a doubful skin reaction to 1/20 mg. tuberculin injected intracutaneously, but a strongly positive skin reaction was obtained with 0.5 mg. The physical examination and blood studies were negative. At the end of January, 1947, the vision was correctable in each eye to 20/20. Many absorbing red blood cells could be seen in the vitreous of the right eye with the corneal microscope.

He was observed periodically during the following nine months and no further hemorrhages occurred. However, retinitis proliferans developed in the lower nasal quadrant of the right retina. There were many unabsorbed vitreous hemorrhages inferiorly.

He carried along satisfactorily without trouble as a university teacher for the next five years. As he then moved to England, no further observations were made after September, 1947.

CASE 25. This twenty-two-year-old laborer was seen in February, 1951, complaining of blurring of vision in both eyes for two weeks. The vision was correctable in each eye to 20/40—2. There were numerous peripheral hemorrhages in the right eye at 12:00 o'clock and in the upper temporal quadrant extending to 9:00 o'clock. The veins in the periphery of the retina at these points were dilated and there was a fine line of exudation along the vessel walls. In the left eye there were numerous hemorrhages in the periphery at 1:00 o'clock and periphlebitis was also present at this point. Examination of the vitreous with the corneal microscope revealed large numbers of red blood cells in both eyes. He was given 50 mg. of cortisone intramuscularly twice a day for one week and cortisone ophthalmic drops in both eyes every hour in the daytime. Physical examination and chest X ray were negative. The Westergren sedimentation rate determination was 35 mm. and repeat determination was 36 mm. The skin tuberculin test was positive to 1/20 mg. intracutaneously.

He was advised to have eight hours' sleep, reduce his smoking, use no alcohol, drink one quart of pasteurized milk a day, and be on a full diet. In addition he was advised to walk several miles per day in order to improve his general condition. One month later the vision was 20/20 in each eye. There were new hemorrhages in the right eye in the lower temporal retina peripherally with periphlebitis of the adjacent veins. No hemorrhages were noted into the left retina at the site of the previous bleeding. In December, 1953, the vision in each eye was 20/20. There was no sign of hemorrhage or periphlebitis and only a fine dusty marking was observed in the periphery of the retinas at the sites of the previous hemorrhages.

Since this patient's single retinal and vitreous hemorrhage there has been no recurrence. The hemorrhages absorbed rapidly and no sequelae could be found three years later. He has had repeated chest X rays which have always been negative. In 1943 an older sister was in a tuberculosis sanatorium with active pulmonary tuberculosis.

CASE 26. In September, 1951, this thirty-one-year-old nurse had blurring of vision in her left eye and thrombosis of a retinal vein was diagnosed. The vision was 20/80 at the onset. Anticoagulant therapy was given for five months. In March, 1952, while sitting, she had another large vitreous hemorrhage and was confined to bed for a month. In six weeks the vision improved remarkably but another hemorrhage occurred on awakening in May, 1952, and she was put to bed for a further four months without apparent improvement in the vision. In August, 1952, while washing her hair, she had a larger hemorrhage with resulting deterioration of vision. She was then confined to bed from August, 1952, until June, 1953, and was given 1 Gm. of streptomycin every third day, 12 Gm. of para-amino salicylic acid, and 200 mg. of isoniazid a day until December, 1953. A further hemorrhage occurred in December, 1952, and she could see fresh blood in the field of vision of her left eye for the following two months. The physical examination, blood studies and repeated X rays of the chest were

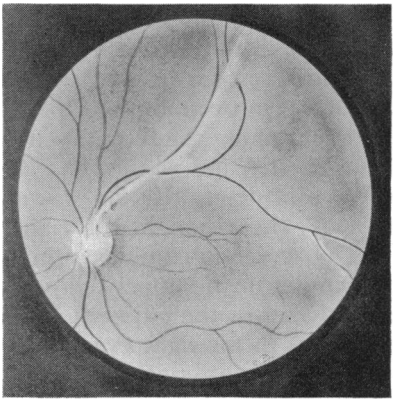

FIGURE 27. CASE 26
Inactive, healed stage; extensive retinal scar and perivascular sheathing.

negative for tuberculosis but the skin tuberculin test was positive to 1/20 mg. intracutaneously.

In April, 1953, 0.5 c.c. of 2.5 percent cortisone ophthalmic solution was injected subconjunctivally every five days, then every three weeks for the following four months, and at the present time she is receiving

one subconjunctival injection of cortisone monthly. In December, 1953, the vision was 20/20 in the right eye and 20/30 in the left eye. The right eye was normal. In the left eye the upper temporal retinal vein was dilated and tortuous almost to the periphery, and there was a dense white fibrous scar running from the disc above the vein upward and temporally and, at places, there was sheathing of the vessel wall to the periphery of a lower branch of the vessel (Fig. 27). In the periphery of the upper temporal quadrant there was a large area of whitish scarring extending from 1:00 to 3:00 o'clock. There were many cloudy vitreous opacities inferiorly, and examination of the vitreous with the corneal microscope revealed masses of absorbing red blood cells.

This patient had active retinal periphlebitis from September, 1951, until December, 1952, but since then the vision has steadily improved. She was placed on a convalescent tuberculous routine in bed for eleven months. At the present time there are no signs of activity and the lesion is probably inactive and healed. There was no correlation between the menses and the intraocular hemorrhages.

CASE 27. In June, 1936, this twenty-one-year-old patient complained of sudden blurring of vision in his left eye while walking. The vision was reduced to perception of hand motion. The physical examination was negative except for a positive skin tuberculin test to 1/20 mg. The vision gradually improved in the left eye but did not return to normal. He had a further, less severe, hemorrhage in the left eye in November, 1937. The first hemorrhage in the right eye occurred in February, 1939, and he was confined to bed rest for six weeks; the vision had gradually improved almost to normal in two months. Ophthalmoscopic examination revealed hemorrhages along the retinal veins and in the vitreous. In 1942 vitreous from the left eye was aspirated and replaced and in 1943 a course of tuberculin desensitization was carried out over three months. In March, 1948, the vision in the right eye was 20/30, and 20/80 in the left eye. Ophthalmoscopic examination indicated in the right eye many new venules in the upper temporal retina peripherally and there were hemorrhages in the adjacent retina. In June, 1953, he had moderate hemorrhage in his right eye and was unable to read or drive a car for one month.

In January, 1954, the vision in the right eye was 20/20 and 20/70 in the left eye. The left eye had turned in when he was a child, and may have been amblyopic. Ophthalmoscopic examination of the right eye indicated a large number of small venous whorls in the upper temporal retina peripherally, distal to which was whitish scarring. There were many vitreous opacities in the lower nasal vitreous. In the upper nasal retina the vein was dilated in the midperiphery, distal to which retinitis proliferans was developing and there were several small, partially absorbed hemorrhages. In the left eye there was marked peri-

vascular sheathing lining the lower nasal vein from the midperiphery distally. The fundus was obscured inferiorly, but appeared to be normal, and no abnormalities were noted in the macula or elsewhere.

This case has been under observation for 17 years, the longest period in this series, and it is noteworthy that the visual acuity is excellent in the right eye and probably not reduced in the left, amblyopic eye.

CASE 28. This twenty-three-year-old laborer had severe blurring in the right eye in October, 1950, at the end of a day's work, so that he could only count fingers at a distance of 3 feet. The vision gradually improved to normal by March, 1951. No further hemorrhages occurred in the eye until he was hit in the upper eyelid by a stone in June, 1952, and 20 minutes later the vision was suddenly blurred to 20/200. This cleared to nearly normal within 10 days. In September, 1952, he was hit on the bridge of the nose by a bar and the following morning he had severe blurring in both eyes so that he was only able to perceive fingers.

The physical examination, chest X rays, blood studies, and so on were negative. The tuberculin test was negative to 1/100 mg. The vision in the left eye gradually improved to normal during the next six months, but there was no improvement in the right eye. Ophthalmoscopic examination revealed in the right eye a completely black reflex from a massive vitreous hemorrhage. In the left eye there was an extensive rete mirabile in front of the disc. There were several sites of neovascularization along the upper temporal vessels and perivascular sheathing was present on both sides of the upper temporal vein to the periphery. There were many new venules distal to the first bifurcation of the upper nasal vein and perivascular sheathing was present. Some disorganization in the smaller capillaries was noted in the lower nasal quadrant, together with evidence of previous hemorrhages. There were numerous hemorrhages in the lower temporal quadrant along the vein and an absorbing crescentic vitreous hemorrhage was present below the disc. Corneal microscopic study revealed many red blood cells in the vitreous in the right eye and on the posterior surface of the lens. During 1953 there were four hemorrhages with blurring in the left eye and with return of vision to nearly normal within a week or two in each instance. The hemorrhages occurred usually after stooping over or after awakening.

For four months in the fall of 1953 he took 80 mg. rutin and 150 mg. ascorbic acid daily. In January, 1954, the vision in the right eye was light perception and in the left eye it was 20/30. The right eye was injected circumcorneally, the iris had become brownish, and there were numerous cells in the anterior chamber. There was a dense posterior lens opacity with frank blood on the vitreous surface and there were numerous orange deposits beneath the capsule of the lens an-

teriorly. The intraocular pressure was 16 mm. Hg (Schiötz) in the right eye and 22 mm. Hg (Schiötz) in the left eye. Ophthalmoscopic examination indicated a faint red reflex in the right eye while in the left eye the rete mirabile had extended further into the vitreous. The upper temporal vein was dilated and there were three sites of large venous varicosities, from the disc to the midretina, beyond which there was perivascular sheathing to the periphery with narrowing of the vein. The upper nasal vein was dilated near the disc and there was one area of varicosities beyond the first bifurcation, distal to which the vein was sheathed. There was perivascular sheathing in the periphery of the lower nasal vein and in the lower temporal quadrant the vein was almost completely occluded peripherally from sheathing. The crescentic hemorrhage below the disc was almost absorbed.

This patient demonstrates marked activity in both eyes at the present time. The prognosis is poor for his remaining eye. He probably will have to have the right eye removed shortly because of the development of iridocyclitis from the recurrent intraocular hemorrhages. As he lived at some distance it was not possible to repeat the tuberculin skin test with a larger test dose.

Case 29.This twenty-five-year-old veteran was seen in January, 1950, stating that three days previously he had awakened to find that his vision in the left eye had practically gone. On examination the vision in the right eye was 20/20 and in the left eye 20/100. In the right eye there were several small hemorrhages in the retina inferiorly adjacent to the peripheral veins, and the two superior veins were sheathed in the mid-retina. In the left eye there was a pre-retinal hemorrhage near the macula and there were large hemorrhages peripherally, in the lower temporal retina adjacent to the veins. There was marked sheathing of the veins in the upper temporal peripheral retina (Fig. 28). The skin tuberculin test was positive to 1/20 mg. intracutaneously.

The medical examination was negative except for a low-grade chronic prostatitis and no abnormality in the blood studies was found. Further observation in April, 1950, showed that the vision had improved in the left eye to 20/40 and the hemorrhage adjacent to the macula had completely absorbed. However, there were several new hemorrhages in the retina below the macula. The vision in the left eye continued to improve and in May, 1950, it was 20/25. He left the district and returned to his home, where he was admitted to hospital in August, 1950, for a course of systemic cortisone therapy. He was seen again in October, 1950, stating that 10 days previously he had two shadows appear in the field of vision of the left eye, which had previously been clear. Three days before this admission further blurring occurred in the left eye, and on examination the vision was 20/15 in the right eye and 20/30—2 in the left eye. There were numerous scat-

tered hemorrhages temporally and superiorly with exudation along the peripheral veins in the left retina and retinitis proliferans was commencing in the lower temporal quadrant. In the right eye there were no retinal hemorrhages, but there was sheathing of the nasal vein. He was hospitalized for six months for treatment with di-hydro streptomycin 1½ Gm., and 7½ Gm. para-amino salicylic acid daily.

In December, 1950, marked perivascular streaking was noted along the lower branch of the upper nasal vein in the right eye but no hemor-

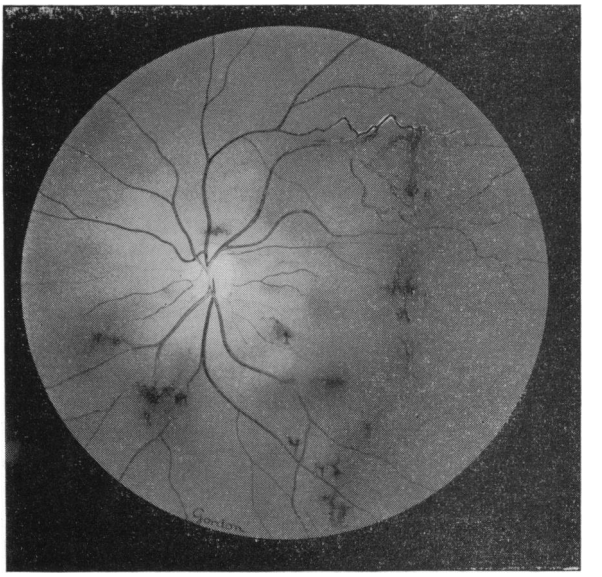

FIGURE 28. CASE 29
Active stage, showing retinal and vitreous hemorrhages and perivascular exudation at onset.

rhages were present. There was some perivascular sheathing along the upper temporal vein and there was evidence of old fibrosis in the periphery in the lower temporal retina. In the left eye there were numerous vitreous opacities and there was extensive disorganization at the disc superiorly, with numerous globular hemorrhages from a dilated vein. The fundus was obscured by the hemorrhages, but there was marked sheathing of the veins in the midperiphery of the retina temporally.

General treatment was carried out; it consisted of exercise in the gymnasium under supervision and ultraviolet light therapy with a high-vitamin diet. His physical condition was excellent and complete absorption of the blood in the left eye appeared to be taking place until suddenly, after playing volleyball in April, 1951, he had a massive

vitreous hemorrhage inferiorly with blood extending over the disc. This was slow in absorbing and resulted in a marked retinitis proliferans.

In October the vision in the right eye was 20/15 and in the left eye 20/25. In the right eye there was a small perivascular exudation in the periphery of the upper temporal retina alongside a terminal vein. There was a similar perivascular exudation on both sides of a vein peripherally at 3:00 o'clock. The right vitreous was clear except for a small hemorrhage superiorly. In the left eye the vitreous was hazy and there was disorganization of the retina in the upper temporal quadrant with retinitis proliferans. There was an absorbing hemorrhage on both sides of the upper temporal vein beyond the first arteriovenous crossing. Nasally in the lower quadrant there were absorbing hemorrhages in the periphery of the retina but it was obscured partially because of vitreous opacities. There was marked perivascular exudation along the vein temporally at 3:00 o'clock. In May, 1952, the vision was 20/15 in the right eye and 20/25 in the left eye, and there were no further hemorrhages into either eye. In the left eye retinitis proliferans was present in the upper temporal quadrant but otherwise the fundus findings were unchanged, although the vitreous opacities inferiorly were becoming whitish. The patient moved away and no opportunity presented itself to examine the eyes further.

This young man had marked activity in his left eye for at least two and a half years, with minimal activity in the right eye. The chest X ray was negative on numerous occasions, but the skin tuberculin test was strongly positive. A guinea-pig inoculation of the urine did not reveal tubercle bacilli. During his hospitalization records were obtained of the body temperatures and at no time was there elevation.

Case 30. This forty-four-year-old laborer had sudden blurring of vision in the left eye on awakening in March, 1948. One week later the vision was 20/20 in the right eye and 20/30—2 in the left eye. There were many hemorrhages in the temporal and inferior retina adjacent to the veins, which were markedly dilated, and a large vitreous hemorrhage was lying in front of the disc. The right eye was normal. Physical examination, chest X ray, and blood studies were negative. The skin tuberculin test was strongly positive to 1/20 mg. intracutaneously. He was confined to bed for one week and treated with 60 mg. of rutin and 50 mg. of ascorbic acid daily for two months. In August, 1948, the vision in the left eye had improved to 20/20—2 and there were no hemorrhages in the retina. He did not report for further observation and could not be located for clinical follow-up study.

Case 31. This seventeen-year-old boy noticed spots before the left eye in June, 1946, but there was no blurring of vision. In October, 1946,

after skating, he had a sudden blurring of vision in the left eye and the vision was approximately 20/200 the following day. In one month the vision had improved to 20/120; at the ophthalmoscopic examination at this time a massive vitreous hemorrhage and many hemorrhages in the retina inferiorly were noted. In December, 1946, ophthalmoscopic examination of the right eye revealed perivascular exudation along the peripheral veins, with irregular dilatation of the veins except in the upper temporal quadrant. In the left eye there were massive peripheral hemorrhages and a large partially absorbed vitreous hemorrhage. The physical examination and chest X ray were negative. The skin tuberculin test was positive, using 1/20 mg. tuberculin, and a course of tuberculin desensitization was commenced. In addition 3,500 roentgen units in divided doses were directed to the left temporal retina through one portal. By the middle of January, 1947, the vision in the left eye had improved to 20/40 and there was a large area of choroidal atrophy inferiorly. Retinitis proliferans was developing in the left eye by April, 1947, although the vision was 20/30. The tuberculin injections were discontinued in June, 1947. Ophthalmoscopic examination in August of the same year revealed one fresh hemorrhage between the macula and the disc. There was no significant change in the right eye until September, 1949, when slight blurring occurred and a small hemorrhage was noted in the temporal region.

He developed a hematuria in April, 1949, and genito-urinary, cystoscopic examination and culture of the urine for tubercle bacilli were negative.

In November, 1953, a further small hemorrhage occurred in the left eye. In January, 1954, the vision in the right eye was 20/15 and 20/30 in the left eye. Ophthalmoscopic examination indicated in the right eye a small absorbing hemorrhage in the midtemporal vitreous. There was moderate perivenous sheathing in the adjacent vein, extending to the periphery. The upper nasal vein was sheathed in the midperiphery and distally there was a very small partially absorbed preretinal hemorrhage. In the left eye there were numerous fibrous bands in the vitreous in front of the midretina nasally, distal to which the retina was depigmented, and a partially absorbed hemorrhage was present in the periphery. The upper temporal vein was sheathed from the midretina distally, with some fibrous tissue lying in front of a bifurcation. There was a fairly large partially absorbed retinal hemorrhage in the periphery of the lower temporal quadrant.

This patient was the youngest in the series. It is probable that some activity is still present in the left eye more than seven years after the first hemorrhage.

TABLE 10. RECURRENT INTRAOCULAR HEMORRHAGES IN YOUNG ADULTS; EALES'S DISEASE

	CASE 1. LEFT EYE	CASE 2. BOTH EYES	
		Left	*Right*
Date of onset	March, 1945	May, 1941	December, 1943
Age at onset	29	20	23
Duration of observation	8¾ years	11 years	11 years
Presenting symptoms and visual acuity	Slight blur; 20/30	Slight blur; 20/30	Slight blur; 20/30
Fundus at first examination	Peripheral venous hemorrhages, perivascular exudation, vitreous hemorrhages inferiorly	Dilated inferior temporal vein with adjacent hemorrhages	Not recorded
Sequelae	Retinitis proliferans	Recurrent hemorrhages	Recurrent hemorrhages
Poorest vision and date	Hand motion; October, 1945	Hand motion; July, 1942 and 1949	20/30 —
Present vision	20/200	20/60	20/20
Concurrent disease	Healed tuberculosis	Active pulmonary tuberculosis, 1941–47	
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	
X ray of chest	Fibrosis, right first interspace	Tuberculosis	
Treatment	Bed rest	Bed rest	
Occupation:			
Service	Air force navigator	Army	
Civilian	Advertising exec.	Radio repairs	
Period of activity	3 1/3 years	12 years	10 years
Present status	Inactive, healed	Inactive, healed	Active ?

	CASE 3. BOTH EYES		CASE 4. RIGHT EYE
	Right	*Left*	
Date of onset	June, 1947	June, 1947	March, 1946
Age at onset	24	24	24
Duration of observation	6½ years	6½ years	6 months
Presenting symptoms and visual acuity	Severe blurring; 10/400	None; 20/20	Moderate blur; 20/100
Fundus at first examination	Large vitreous hemorrhage	A few hemorrhages in upper temporal retina peripherally near veins	Complete peripheral venous hemorrhages, perivascular exudation
Sequelae	Retinitis proliferans, glaucoma	No red reflex in June, 1948	Recurrent hemorrhages, retinitis proliferans

TABLE 10. (*Continued*)

	CASE 3 (CONT.)		CASE 4 (CONT.)
Poorest vision and date	Blind; December, 1953	Light perception; December, 1953	20/100; March, 1946
Present vision	Blind	Light perception, December, 1953	Died
Concurrent disease	Pulmonary tuberculosis, 1945–49		Tuberculous pericarditis
Tuberculin test	Positive 1/20 mg.		Positive 1/20 mg.
X ray of chest	Right pulmonary tuberculosis		Negative at onset
Treatment	Bed rest for 2 months, then streptomycin 2 Gm. for 7 weeks		Massive doses of penicillin
Occupation:			
Service	Army overseas		Air Force
Civilian	Author		—
Period of activity	2 years	2 years	6 months
Present status	Inactive, healed	Inactive, healed	Deceased

	CASE 5. RIGHT EYE	CASE 6. BOTH EYES	
		Right	*Left*
Date of onset	February, 1943	1947	September, 1950
Age at onset	27	29	32
Duration of observation	10½ years	6 years	3¼ years
Presenting symptoms and visual acuity	Marked blurring; 20/120	Slight blur; 20/40	Spots; 20/25
Fundus at first examination	Superior temporal retinal hemorrhages	Retinitis proliferans, perivascular exudation	Retinal hemorrhages
Sequelae	Exotropia	Repeated hemorrhages, retinitis proliferans	Retinitis proliferans
Poorest vision and date	Light perception; December, 1953	20/100; December, 1953	20/30; January, 1952
Present vision	Light perception	20/100	20/30
Concurrent disease	Healed tuberculosis?	Pulmonary tuberculosis, 1940–42, 1945–47	
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	
X ray of chest	Calcified density, left apex	Healed apical tuberculosis	
Treatment	Maintain general health	ACTH	ACTH
Occupation:			
Service	Army	—	
Civilian	Clerical	Clerical	
Period of activity	6 months	5 years	2½ years
Present status	Inactive, healed	Inactive, healed?	Inactive, healed?

TABLE 10. (*Continued*)

	CASE 7. RIGHT EYE	CASE 8. BOTH EYES	
		Left	*Right*
Date of onset	September, 1945	March, 1950	October, 1950
Age at onset	28	24	24
Duration of observation	8¼ years	2¾ years	2¾ year
Presenting symptoms and visual acuity	Moderate blurring; 20/100	Severe blurring; light perception	None; 20/15
Fundus at first examination	Retinal hemorrhage	Massive vitreous hemorrhage	Perivenous hemorrhages
Sequelae	Retinitis proliferans	None	None
Poorest vision and date	20/100; August, 1946	Light perception; March, 1950	20/15 —
Present vision	20/30	20/60	20/15
Concurrent disease	Healed tuberculosis	Healed tuberculosis	
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	
X ray of chest	Tubercle first left interspace	Opacities in apices	
Treatment	Bed rest	Streptomycin and para-amino salicylic acid	
Occupation:			
Service	Army	—	
Civilian	Factory worker	Student	
Period of activity	4 years	2 years	2 years
Present status	Inactive, healed	Inactive, healed?	Inactive, healed?

	CASE 9. LEFT EYE	CASE 10. BOTH EYES	
		Left	*Right*
Date of onset	March, 1948	April, 1952	November, 1953
Age at onset	36	22	22
Duration of observation	5¾ years	1¾ years	1¾ years
Presenting symptoms and visual acuity	Marked blurring; light perception	Marked blurring; 10/400	None; 20/20
Fundus at first examination	Black reflex	Large vitreous hemorrhage	Peripheral scarring temporally, dilated veins
Sequelae	Rete mirabile	Vitreous hemorrhage	None
Poorest vision and date	Light perception; March, 1948	Hand motion; November, 1953	20/20 —
Present vision	20/200	Hand motion	20/20
Concurrent disease	Dysentery, beri-beri	None	

TABLE 10. (*Continued*)

	CASE 9 (CONT.)	CASE 10 (CONT.)	
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	
X ray of chest	Obliteration left costophrenic angle	Negative	
Treatment	Bed rest	Bed rest	None
Occupation:			
Service	P.O.W. Japan	—	
Civilian	Farmer	Nurse	
Period of activity	6 months	1 year	Nil
Present status	Inactive, healed	Active	Precursor

	CASE 11. BOTH EYES		CASE 12. LEFT EYE
	Left	*Right*	
Date of onset	August, 1947	1949	November, 1944
Age at onset	41	43	30
Duration of observation	6½ years	4 years	9 years
Presenting symptoms and visual acuity	Marked blurring; hand motion	Spots —	Marked blurring; hand motion
Fundus at first examination	Massive vitreous hemorrhage	Inactive periphlebitis	Peripheral retinal hemorrhages
Sequelae	Secondary glaucoma	None	Recurrent hemorrhages, iritis
Poorest vision and date	No light perception; May, 1950	20/15 —	No light perception; July, 1948
Present vision	Enucleated May, 1952	20/15	Enucleated September, 1950
Concurrent disease	Cervical lymphadenopathy		Ulcerative colitis, pyelitis
Tuberculin test	Positive 1/20 mg.		Positive 1/20 mg.
X ray of chest	Negative		Negative
Treatment	Tuberculin, promizole, streptomycin, and PAS	None	Bed rest, tuberculin
Occupation:			
Service	—		Pilot
Civilian	Sales executive		Clerk
Period of activity	5 years	2 years	6 years
Present status	Inactive	Inactive, healed	Inactive

TABLE 10. (*Continued*)

	CASE 13. BOTH EYES	
	Left	*Right*
Date of onset	April, 1945	March, 1946
Age at onset	34	35
Duration of observation	7¼ years	7¼ years
Presenting symptoms and visual acuity	Marked blurring; hand motion	Slight blurring; 20/40
Fundus at first examination	Red reflex	Retinal hemorrhages, retinitis proliferans
Sequelae	Recurrent hemorrhages	Recurrent hemorrhages
Poorest vision and date	Light perception; March, 1947	Finger counting; January, 1954
Present vision	20/200	Finger counting at 3 feet
Concurrent disease	None	
Tuberculin test	Positive 1/20 mg.	
X ray of chest	Negative	
Treatment	Tuberculin, 4,550 roentgen units to posterior segments	
Occupation: Service	—	
Civilian	Clerical	
Period of activity	2 years	7¾ years
Present status	Inactive, healed	Active

	CASE 14. BOTH EYES	
	Left	*Right*
Date of onset	April, 1946	November, 1947
Age at onset	26	28
Duration of observation	7½ years	6 years
Presenting symptoms and visual acuity	Marked blurring; 10/400	None; 20/15
Fundus at first examination	Vitreous hemorrhage	Dilated vein with large loop
Sequelae	Retinitis proliferans	None
Poorest vision and date	10/400; April, 1946	20/15 —
Present vision	20/20	20/15
Concurrent disease	None	
Tuberculin test	Positive 1/20 mg.	
X ray of chest	Negative	
Treatment	Bed rest	None
Occupation: Service	Army	
Civilian	Factory worker	
Period of activity	1½ years	Nil
Present status	Inactive, healed	Precursor

TABLE 10. (*Continued*)

	CASE 15. BOTH EYES	
	Left	*Right*
Date of onset	November, 1943	July, 1944
Age at onset	26	27
Duration of observation	9 years	9 years
Presenting symptoms and visual acuity	Marked blurring; finger counting	Moderate blurring; —
Fundus at first examination	Vitreous hemorrhage	Retinal hemorrhages
Sequelae	Macular scarring and choroiditis	Retinitis proliferans
Poorest vision and date	Hand motion; August, 1945	Not known
Present vision	Finger counting	20/20
Concurrent disease	None	
Tuberculin test	Positive 1/20 mg.	
X ray of chest	Negative	
Treatment	Tuberculin, bed rest	
Occupation: Service	Army	
Civilian	Railroad brakeman	
Period of activity	6 months	9 years
Present status	Inactive, healed	Active

	CASE 16. LEFT EYE	CASE 17. RIGHT EYE	CASE 18. LEFT EYE
Date of onset	February, 1944	January, 1953	September, 1947
Age at onset	21	30	22
Duration of observation	8¾ years	1 year	2½ years
Presenting symptoms and visual acuity	Moderate blurring; 20/120	Slight blurring; 20/20	Marked blurring; 20/400
Fundus at first examination	Vitreous haze, retinitis proliferans	Preretinal hemorrhage, perivascular exudation	Vitreous hemorrhages
Sequelae	Secondary cataract	Vitreous opacities	Black reflex
Poorest vision and date	Hand motion; May, 1948	10/200; February, 1953	Light perception; February, 1949
Present vision	Hand motion	20/20-2	Light perception
Concurrent disease	None	None	None
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	Positive 1/100 mg.
X ray of chest	Negative	Negative	Negative
Treatment	Bed rest	Cortisone, 12 months	Tuberculin
Occupation:			
Service	Army	—	—
Civilian	Truck driver	Physician	Laborer
Period of activity	1 year	6 months	9 months
Present status	Inactive, healed	Inactive, healed?	Healed?

TABLE 10. (*Continued*)

	CASE 19. RIGHT EYE	CASE 20. BOTH EYES	
		Right	*Left*
Date of onset	November, 1946	April, 1945	May, 1948
Age at onset	30	31	34
Duration of observation	7 years	6 years	5½ years
Presenting symptoms and visual acuity	Snake-like shadow; 20/80	Slight blurring; 20/20	None; 20/30
Fundus at first examination	Vitreous hemorrhage, perivascular exudation and hemorrhages	Retinal hemorrhages	Hemorrhages near vein temporally at 3:00 o'clock
Sequelae	Retinitis proliferans	Retinal detachment	Neovascularization
Poorest vision and date	20/80; November, 1946	Hand motion; March, 1950	20/20; date not known
Present vision	20/20	Hand motion	20/15
Concurrent disease	Cervical lymphadenopathy	None	
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	
X ray of chest	Negative	Negative	
Treatment	Bed rest	Vitamin K, bed rest	
Occupation:			
Service	—	Army	
Civilian	Clerical	Factory worker	
Period of activity	8 months	4½ years	6 months
Present status	Inactive, healed	Inactive, healed	Inactive, healed

	CASE 21. RIGHT EYE	CASE 22. LEFT EYE	CASE 23. RIGHT EYE
Date of onset	November, 1947	May, 1945	October, 1951
Age at onset	25	26	28
Duration of observation	6 years	8¼ years	3 years
Presenting symptoms and visual acuity	Misty vision; 20/20	Slight blurring; 20/25	Slight blurring; 20/15
Fundus at first examination	Vitreous hemorrhage, dilated veins with sheathing	Peripheral hemorrhage	Retinal hemorrhage
Sequelae	None	Retinitis proliferans, cataract	Diathermy scars
Poorest vision and date	Hand motion; March, 1948	Light perception; April, 1946	Not known
Present vision	20/20	20/200	20/20
Concurrent disease	Negative	Cholecystitis	None
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	Positive 1/20 mg.
X ray of chest	Negative	Negative	Negative

TABLE 10. (*Continued*)

	CASE 21 (CONT.)	CASE 22 (CONT.)	CASE 23 (CONT.)
Treatment	Bed rest, rutin and ascorbic acid, tuberculin	Bed rest, tuberculin	Bed rest, diathermy coagulation, cortisone
Occupation:			
Service	—	Air Force	Air Force
Civilian	Salesman	School teacher	Salesman
Period of activity	1½ years	1 year	3 years
Present status	Inactive, healed	Inactive, healed	Active

	CASE 24. RIGHT EYE	CASE 25. BOTH EYES	
		Right	*Left*
Date of onset	December, 1946	February, 1951	February, 1951
Age at onset	38	22	22
Duration of observation	9 months	3 years	3 years
Presenting symptoms and visual acuity	Marked blurring; finger counting	Slight blur; 20/40-2	Slight blur; 20/40-2
Fundus at first examination	Retinal and vitreous hemorrhages	Peripheral hemorrhages	Peripheral hemorrhages
Sequelae	Retinitis proliferans	None	None
Poorest vision and date	Finger counting; December, 1946	20/40-2; February, 1951	20/40-2; February, 1951
Present vision	20/20	20/20	20/20
Concurrent disease	None	None	
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	
X ray of chest	Negative	Negative	
Treatment	Bed rest	Bed rest, cortisone	
Occupation:			
Service	—	—	
Civilian	Teacher	Laborer	
Period of activity	6 months	6 months	6 months
Present status	Inactive, healed	Inactive, healed	Inactive, healed

	CASE 26. LEFT EYE	CASE 27. BOTH EYES	
		Left	*Right*
Date of onset	September, 1951	June, 1936	February, 1939
Age at onset	31	21	24
Duration of observation	2¼ years	17½ years	15 years
Presenting symptoms and visual acuity	Moderate blurring; 20/80	Severe blurring; hand motion	Severe blurring; 20/200

TABLE 10. (*Continued*)

	CASE 26 (CONT.)	CASE 27 (CONT.)	
Fundus at first examination	Retinal hemorrhages	Massive vitreous hemorrhage	Peripheral venous hemorrhages
Sequelae	Scar above macula	None	Retinitis proliferans
Poorest vision and date	Not known	Hand motion; June, 1936	20/200; February, 1939
Present vision	20/30	20/70, amblyopia exanopsia	20/20
Concurrent disease	None	None	
Tuberculin test	Positive 1/20 mg.	Positive 1/20 mg.	
X ray of chest	Negative	Negative	
Treatment	Bed rest, streptomycin and PAS, isoniazid, cortisone	Bed rest, vitreous transplant, tuberculin desensitization	Bed rest
Occupation:			
Service	—	—	
Civilian	Nurse	Priest	
Period of activity	1¼ years	2 years	14 years
Present status	Inactive, healed	Inactive, healed	Inactive?

	CASE 28. BOTH EYES	
	Right	*Left*
Date of onset	October, 1950	September, 1952
Age at onset	23	25
Duration of observation	3¼ years	1½ years
Presenting symptoms and visual acuity	Severe blurring; finger counting	Severe blurring; finger counting
Fundus at first examination	Massive vitreous hemorrhage	Rete mirabile, neovascularization
Sequelae	Iridocyclitis	Perivenous sheathing
Poorest vision and date	Light perception; January, 1954	Finger counting; September, 1952
Present vision	Light perception	20/30
Concurrent disease	None	
Tuberculin test	Negative 1/100 mg.	
X ray of chest	Negative	
Treatment	Rutin and ascorbic acid	
Occupation: Service	—	
Civilian	Laborer	
Period of activity	3½ years	3½ years
Present status	Active	Active

TABLE 10. (*Continued*)

	CASE 29. BOTH EYES		CASE 30. LEFT EYE
	Left	*Right*	
Date of onset	January, 1950	January, 1950	March, 1948
Age at onset	25	25	44
Duration of observation	2½ years	2½ years	½ year
Presenting symptoms and visual acuity	Severe blurring; 20/100	None; 20/15	Slight blur; 20/30
Fundus at first examination	Paramacular hemorrhage, perivenous hemorrhages	Perivenous hemorrhages, perivenous sheathing	Venous hemorrhages, vitreous hemorrhage
Sequelae	Retinitis proliferans	Not known	Retinitis proliferans
Poorest vision and date	20/100; January, 1950	20/15; Date not known	20/30; March, 1948
Present vision	20/25	20/15	20/30
Concurrent disease	Chronic prostatitis		None
Tuberculin test	Positive 1/20 mg.		Positive 1/20 mg.
X ray of chest	Negative		Negative
Treatment	Cortisone, streptomycin, and para-amino salicylic acid		Bed rest, rutin and ascorbic acid
Occupation:			
Service	—		Army
Civilian	Student		Laborer
Period of activity	2½ years	2½ years	6 months
Present status	Inactive, healed	Inactive, healed	Inactive, healed?

	CASE 31. BOTH EYES	
	Left	*Right*
Date of onset	June, 1946	June, 1946
Age at onset	17	17
Duration of observation	7½ years	7½ years
Presenting sumptoms and visual acuity	Severe blurring; 20/120	None; 20/20
Fundus at first examination	Vitreous and retinal hemorrhages	Irregular dilatation of veins with exudation
Sequelae	None	None
Poorest vision and date	20/200; October, 1946	20/20 —
Present vision	20/30	20/20
Concurrent disease	Hematuria, 1949	
Tuberculin test	Positive 1/20 mg.	
X ray of chest	Negative	
Treatment	Tuberculin; 3,500 roentgen units	
Occupation: Service	—	
Civilian	Student	
Period of activity	7½ years	3½ years
Present status	Inactive, healed?	Inactive, healed

TREATMENT

There is no specific treatment known for Eales's disease. In general these patients have been treated as if they were tuberculous, by tuberculin and general hygienic measures. However, further hemorrhages have frequently occurred during tuberculin therapy, probably from focal reactions, and this form of treatment has not met with uniform success or acceptance. Such reactions took place in Cases 21 and 22 in this series. Although O'Malley (33) felt that the disease had many of the characteristics of an allergic response, he did not advocate a specific protein for desensitization. Bed rest is certainly important for one or two weeks at the time of a hemorrhage in order to allow absorption of the hemorrhage. Likewise, the bactericidal drugs such as promizole, streptomycin, para-amino salicylic acid, and isoniazid have not been uniformly beneficial in this disease (see Cases 8 and 26).

Radiation therapy to the posterior segment of the eye has been employed by Guyton and Reese (32) and Larsson (34). This form of therapy was followed in Cases 13 and 31 of this series with doubtful success. Subsequently Reese (35) has observed further hemorrhages in patients treated with radiation. Diathermy coagulation was advocated by Weve (36) for Eales's disease, but in Case 23 it did not prevent further intraocular hemorrhage.

Vitamin K, rutin, and ascorbic acid have been employed in this series, but no beneficial result was apparent. In Case 27 the vitreous was aspirated in the left eye, but this procedure seems too heroic to be advocated.

Cortisone and ACTH have been tried in a relatively few cases. Duke-Elder (37) summarizes the experience recorded in 12 reports, plus his own experience, and states that both local and general treatment have been unsuccessful. Gordon, McLean, and Koteen (38) reported some improvement in one of two cases in which these agents were employed. In the present series, in Case 6 ACTH was administered intravenously in hospital and Case 26 was treated with cortisone systemically and subconjunctivally for a prolonged period. In Case 17 cortisone was used systemically for one year. In all three patients there were no further hemorrhages.

If this disease is due to a hypersensitivity to tuberculoprotein as

previously discussed under etiology, then cortisone and ACTH may block the allergic reaction as long as a maintenance dosage is administered. Woods (39) feels that in spite of the poor results reported so far with this hormone therapy in Eales's disease, opinion should be withheld for the present. Further experience may show that the disease may be held in check by the use of cortisone or ACTH over the period of recurrent hemorrhages. How long these hormones should be continued cannot be stated from the limited experience to date.

SUMMARY AND CONCLUSIONS

1. Thirty-one cases of recurrent intraocular hemorrhages in young adults (Eales's disease) have been studied. The clinical history and findings were so similar that the disease may be considered a clinical entity and not a manifestation of many diseased conditions. There are hemorrhages from the peripheral retinal veins, perivascular exudation, and, in many instances, hemorrhages into the vitreous.

2. Active or healed pulmonary tuberculosis was present in 35 percent of the cases in this series and the skin tuberculin test was positive in all except one doubtful case. Accordingly, from an etiologic point of view, it is suggested that the condition occurs in individuals who have been previously sensitized to tuberculoprotein, and the hemorrhage and exudation are a local reaction in a hypersensitive vessel wall.

3. Three eyes were available for pathologic study; two had been removed for glaucoma, and one was removed when the patient died from tuberculosis. In the latter case no signs of perivascular inflammatory process were found, while in the first two eyes a nonspecific lymphocytic cuffing was noted.

4. Analysis of the data revealed that the average duration of the recurrent hemorrhages was 2.9 years. The ultimate visual acuity was good in 54 percent of the cases and poor in 26 percent of the patients. The series was under study for an average period of 5.9 years.

5. There is no specific treatment for Eales's disease. In the three patients who were given cortisone or ACTH for prolonged periods, further hemorrhage had not occurred. If this disease is due to

hypersensitivity to tuberculoprotein, then cortisone and ACTH may block the allergic reaction during the natural course of the recurrent hemorrhages.

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